# OWNER'S OPERATING MANUAL

REFLECTION

# CL-410
# CL-420

DLP™ Projectors

RUNCO

THE WORLD'S FINEST HOME THEATER PRODUCTS™

# TWO YEAR LIMITED WARRANTY

## For Projectors, Video Processors and Controllers

Congratulations on your purchase of a Runco video product and welcome to the Runco family! We believe Runco produces "The World's Finest Home Theater Products." With proper installation, setup and care, you should enjoy many years of unparalleled video performance.

This is a LIMITED WARRANTY as defined in the Magnuson-Moss Warranty Act. Please read it carefully and retain it with your other important documents.

### WHAT IS COVERED UNDER THE TERMS OF THIS LIMITED WARRANTY:

SERVICE LABOR: Runco will pay for service labor by Runco Authorized Service Center when needed as a result of manufacturing defect for a period of two (2) years from the effective date of delivery to the end user (excluding the lamp).

PARTS (not including the lamp): Runco will provide new or rebuilt replacement parts for the parts that fail due to defects in materials or workmanship for a period of two (2) years from the effective date of delivery to the end user. Such replacement parts are then subsequently warranted for the remaining portion (if any) of the original warranty period.

PROJECTOR LAMP: Runco will pay for service labor by a Runco Authorized Service Center when needed as a result of a manufacturing defect for a period of six (6) months or 1000 hours, whichever comes first, from the effective date of delivery to the end user. In addition, Runco will provide a new or rebuilt replacement lamp for the lamp that fails due to defects in materials or workmanship for a period of six (6) months or 1000 hours, whichever comes first, from the effective date of delivery to the end user. Such replacement lamps are then subsequently warranted for the remaining portion (if any) of the original warranty period.

### WHAT IS NOT COVERED UNDER THE TERMS OF THIS LIMITED WARRANTY:

This Limited Warranty only covers failure due to defects in materials and workmanship that occur during normal use and does not cover normal maintenance. This Limited Warranty does not cover cabinets or any appearance items; failure resulting from accident, misuse, abuse, neglect, mishandling, misapplication, faulty or improper installation or setup adjustments; improper maintenance, alteration, improper use of any input signal; damage due to lightning or power line surges, spikes and brownouts; damage that occurs during shipping or transit; or damage that is attributed to acts of God. In the case of remote control units, damage resulting from leaking, old, damaged or improper batteries is also excluded from coverage under this Limited Warranty.

CAUTION: THIS LIMITED WARRANTY ONLY COVERS RUNCO PRODUCTS PURCHASED FROM RUNCO AUTHORIZED DEALERS. ALL OTHER PRODUCTS ARE SPECIFICALLY EXCLUDED FROM COVERAGE UNDER THIS WARRANTY. MOREOVER, DAMAGE RESULTING DIRECTLY OR INDIRECTLY FROM IMPROPER INSTALLATION OR SETUP IS SPECIFICALLY EXCLUDED FROM COVERAGE UNDER THIS LIMITED WARRANTY. IT IS IMPERATIVE THAT INSTALLATION AND SETUP WORK BE PERFORMED ONLY BY AN AUTHORIZED RUNCO DEALER TO PROTECT YOUR RIGHTS UNDER THIS WARRANTY. THIS WILL ALSO ENSURE THAT YOU ENJOY THE FINE PERFORMANCE OF WHICH YOUR RUNCO PRODUCT IS CAPABLE WHEN INSTALLED AND CALIBRATED BY RUNCO AUTHORIZED PERSONNEL.

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## EFFECTIVE WARRANTY DATE:

This warranty begins on the effective date of delivery to the end user. For your convenience, keep the original bill of sale as evidence of the purchase date.

## IMPORTANT -- WARRANTY REGISTRATION:

Please fill out and mail your warranty registration card. It is imperative that Runco knows how to reach you promptly if we should discover a safety problem or product update for which you must be notified.

## CONTACT A RUNCO AUTHORIZED SERVICE CENTER TO OBTAIN SERVICE:

Repairs made under the terms of this Limited Warranty covering your Runco video product will be performed at the location of the product, during usual working hours, providing location of product is within normal operating distance from a Runco Authorized Service Center. In some instances it may be necessary for the product to be returned to the Runco factory for repairs. If, solely in Runco's judgment, location of product to be repaired is beyond normal operating distance of the closest Runco Authorized Service Center, or the repair requires the unit be returned to the Runco factory, it is the owner's responsibility to arrange for shipment of the product for repair. These arrangements must be made through the selling Runco Dealer. If this is not possible, contact Runco directly for a Return Authorization number and shipping instructions. Runco will return product transportation prepaid in the United States, unless no product defect is discovered. In that instance, shipping costs will be the responsibility of the owner.

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Runco International products are manufactured under one or more of the following patents: US. Patent 6755540 and Other Patents Pending.

**ADDITIONAL INFORMATION:**

To locate the name and address of the nearest Runco Authorized Service Center, or for additional information about this Limited Warranty, please call or write:

**RUNCO INTERNATIONAL, INC.**
**Attn: Customer Service Department**
**2900 Faber Street**
**Union City, CA 94587**
**Ph: (510) 324-7777**
**Fax: (510) 324-9300**
**Toll Free: (800) 23-RUNCO**

## RUNCO VIDEO-PRODUCT INFORMATION
## RETAIN THIS INFORMATION FOR YOUR RECORDS

Model Purchased _____ Date _____

Serial Number _____

Runco Authorized Dealer Name _____

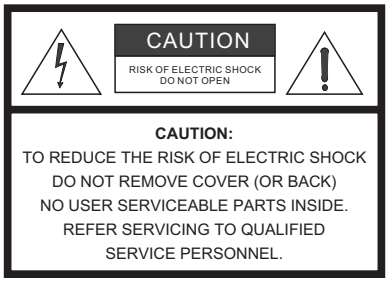
Address _____

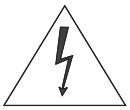
City _____ State/Province _____ Postal Code _____

Phone _____ Fax _____

# Safety Precautions

Thank you for your purchase of this quality Runco video projector! It has been designed to provide you with the quality of video that is expected in a home theater. For the best performance, please read this manual carefully as it is your guide through the menus and operation.



WARNING
This symbol is intended to alert the user to the presence of uninsulated “dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock.

This symbol is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Do not use this equipment near water, outdoors or otherwise exposed to the elements.
5. Clean only with a dry cloth.
6. Do not block any ventilation openings.
7. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
8. Do not defeat the safety feature of the polarized or grounding type plug. A polarized type plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for the replacement of the obsolete outlet.
9. The 12V trigger only outputs DC 12V signal for triggering. Do not connect to any other power input or output. This could cause damage to this unit.
10. Only use accessories specified by Runco International.
11. Keep the packing material in case the equipment should ever need to be shipped.
12. Unplug this projector during lightning storms or when it will not be used for an extended period of time.
13. The lamp becomes extremely hot during operation. Allow the projector to cool down for approximately 45 minutes prior to removing the lamp assembly for replacement. Do not operate lamps beyond the rated lamp life. Excessive operation of lamps beyond rated life could cause them to explode in rare occasions.
14. Refer all servicing to qualified service personnel. Servicing is required when the projector has been damaged in any way, objects have fallen or spilled into the projector, the projector has been exposed to rain or moisture, does not operate normally, or has been dropped.

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## Notes:

# 1. Introduction

## 1.1 About This Manual

This Owner's Manual describes how to install, set up and operate the Runco CL-410 and CL-420 DLP Projectors. Throughout this manual, the Runco CL-410 and CL-420 DLP Projectors are referred to collectively as the "CL-410/CL-420." The information in this manual applies to both projectors except where otherwise indicated.

### ➤ *Target Audience*

Runco has prepared this manual to help home theater installers and end users get the most out of the CL-410/CL-420.

Runco has made every effort to ensure that this manual is accurate as of the date it was printed. However, because of ongoing product improvements and customer feedback, it may require updating from time to time. You can always find the latest version of this and other Runco product manuals on-line, at www.runco.com.

### ➤ *If You Have Comments About This Manual...*

Runco welcomes your comments about this manual. Send them to techpub@runco.com.

### ➤ *Textual and Graphic Conventions*

**Text Conventions:** The following conventions are used in this manual, in order to clarify the information and instructions provided:

- Remote and built-in keypad button identifiers are set in upper-case bold type; for example, "Press **EXIT** to return to the previous menu."
- Computer input (commands you type) and output (responses that appear on-screen) is shown in monospace (fixed-width) type; for example: "To change the aspect ratio to Letterbox, type `RRD02`."
- All keys with functional names are initial-capped, set in bold type and enclosed in angle brackets. These keys are the following: **`<Enter>`, `<Spacebar>`, `<Control>`, `<Esc>`** and **`<Tab>`**.
- **`<Enter>`** indicates that you may press either the RETURN or ENTER key on your keyboard if it has both keys.

In addition to these conventions, underlining, boldface and/or italics are occasionally used to highlight important information, as in this example:

***Note***

*A carriage return **must** be used after each command or string.*

**Graphic Conventions:** These symbols appear in numerous places throughout the manual, to emphasize points that you must keep in mind to avoid problems with your equipment or injury:

***Tip*** — *TIPS highlight time-saving short cuts and helpful guidelines for using certain features.*

***Note*** — *NOTES emphasize text with unusual importance or special significance. They also provide supplemental information.*

***Caution*** — *CAUTIONS alert users that a given action or omitted action can degrade performance or cause a malfunction.*

***WARNING*** — *WARNINGS appear when a given action or omitted action can result in damage to the equipment, or possible non-fatal injury to the user.*

***DANGER!*** — *DANGER appears when a given action can cause severe injury or death.*

## 1.2 Using This Manual

Use the following table to locate the specific information you need in this manual.

| If you need... | ... Turn to page: |
|---|---|
| Information about obtaining service | iv |
| General information about the CL-410 and CL-420 DLP Projectors | 3 |
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## 1.3 Description, Features and Benefits

The Runco CL-410 and CL-420 DLP Projectors combine a highly efficient optical light engine with broad installation and integration options.

Runco has implemented a host of advancements into the projector's light engine to take full advantage of its widescreen, high-definition SuperOnyx™ Digital Micromirror Device (DMD™) chip. The CL-410/CL-420 features Enhanced GEN 3™ technology to produce deeper blacks, greater contrast ratio and brightness, and richly saturated colors.

Among the CL-410/CL-420's features are a sophisticated color-balancing system that results in the industry's best gray scale tracking, and far surpasses the capabilities of CRT projectors. Accurate gray scale reproduction is vital to vibrant, true-to-life color reproduction, as well as superior black level and white level performance. Runco's acclaimed Vivix™ video processing and scaling assure pristine video imagery, while the CL-410/CL-420's generous light output capability is powerful enough to handle screens as large as 96 inches wide with ease.

The CL-420 features a 16:9 aspect ratio resolution of 1280 x 720; the CL-410 boasts a native resolution of 1024 x 576. Both models provide an HDMI input for pure digital video signal transmission. In addition, the projector's broad lens shift capability, variable throw distance, and electronic horizontal and vertical keystone correction allow for flexible placement within virtually any theater environment. Discrete IR and/or serial control makes it simple to partner the CL-410/CL-420 with other audio/video components and automated control systems for a truly high-end, home cinema system.

### ◄ *Key Features and Benefits*

The CL-410/CL-420 offers these key features and benefits:

- Native Resolution: 1024 x 576 (CL-410) or 1280 x 720 (CL-420)
- High-performance Digital Light Processing (DLP™) engine
- HDMI Input with High-bandwidth Digital Content Protection (HDCP)
- HDTV Compatible

***Parts List*** ➤ Your CL-410/CL-420 is shipped with the following items. If any items are missing or damaged, please contact your Runco dealer or Runco Customer Service at (800) 23-RUNCO.

- CL-410 or CL-420 DLP Projector
- AC Power Cord (North America)
- AC Power Cord (Europe)
- Remote Control Unit and two (2), AAA-size batteries
- HD 15-pin VGA to HD 15-pin VGA cable
- DVI-D to DVI-D cable
- DVI-to-HDMI adapter
- Composite video cable (RCA)
- +12-Volt Trigger adapter (3.5-mm, mini phono plug)
- Warranty information and registration card
- Runco CL-410 and CL-420 Owner's Operating Manual (this document)

**Optional Accessories:**

- Ceiling mount kit

# 2. Controls and Functions

## 2.1 CL-410/CL-420 at a Glance

Figure 2-1 and Figure 2-2 show the locations of key CL-410/CL-420 projector components.

### ➤ *Front/Top/Side View*

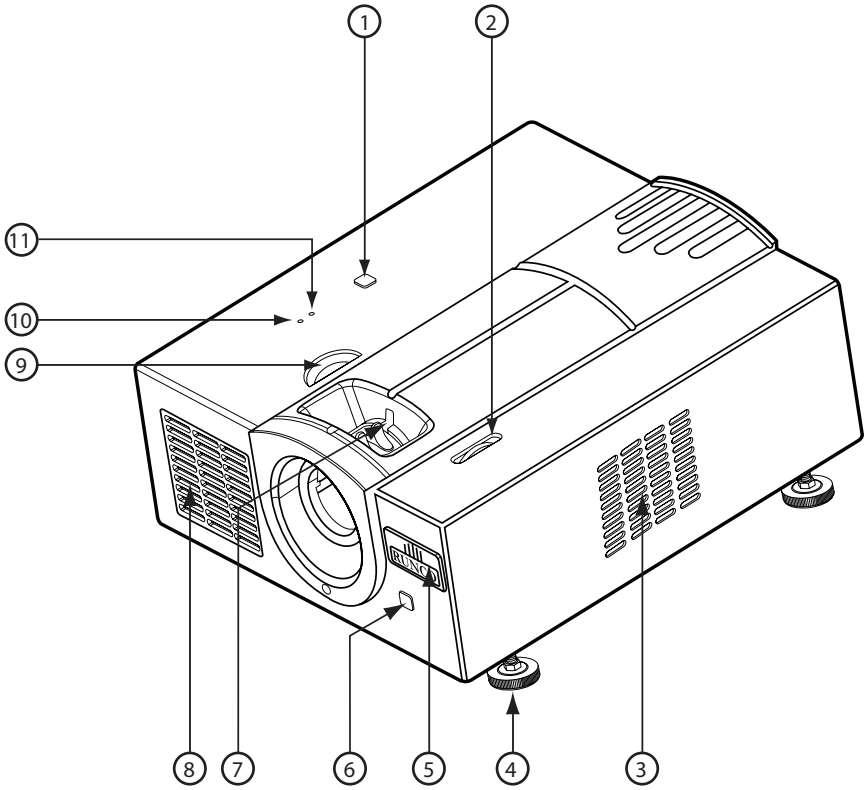



**Figure 2-1. CL-410/CL-420 Top/Front/Side View**

1. **TOP IR SENSOR**
2. **VERTICAL LENS SHIFT DIAL**
   Shifts the image up or down.
3. **INTAKE VENT**
4. **ADJUSTABLE FEET**
   Use to adjust the height or projection angle.
5. **RUNCO LOGO**
   The logo can be rotated to match the projector orientation: inverted (ceiling-mounted) or upright. To rotate the logo, grip it at the sides, pull it away from the projector and rotate it 180 degrees.
6. **FRONT IR SENSOR**

7. **FOCUS/ZOOM RING**
8. **EXHAUST VENT**
9. **HORIZONTAL LENS SHIFT DIAL**
10. **TEMPERATURE INDICATOR**
    Flashes blue when the projector is overheated.
11. **POWER INDICATOR**
    Lights solid blue when the projector is in standby mode; flashes blue during cool-down. During normal operation, this LED is off.

***Rear/Top/Side View*** ➤

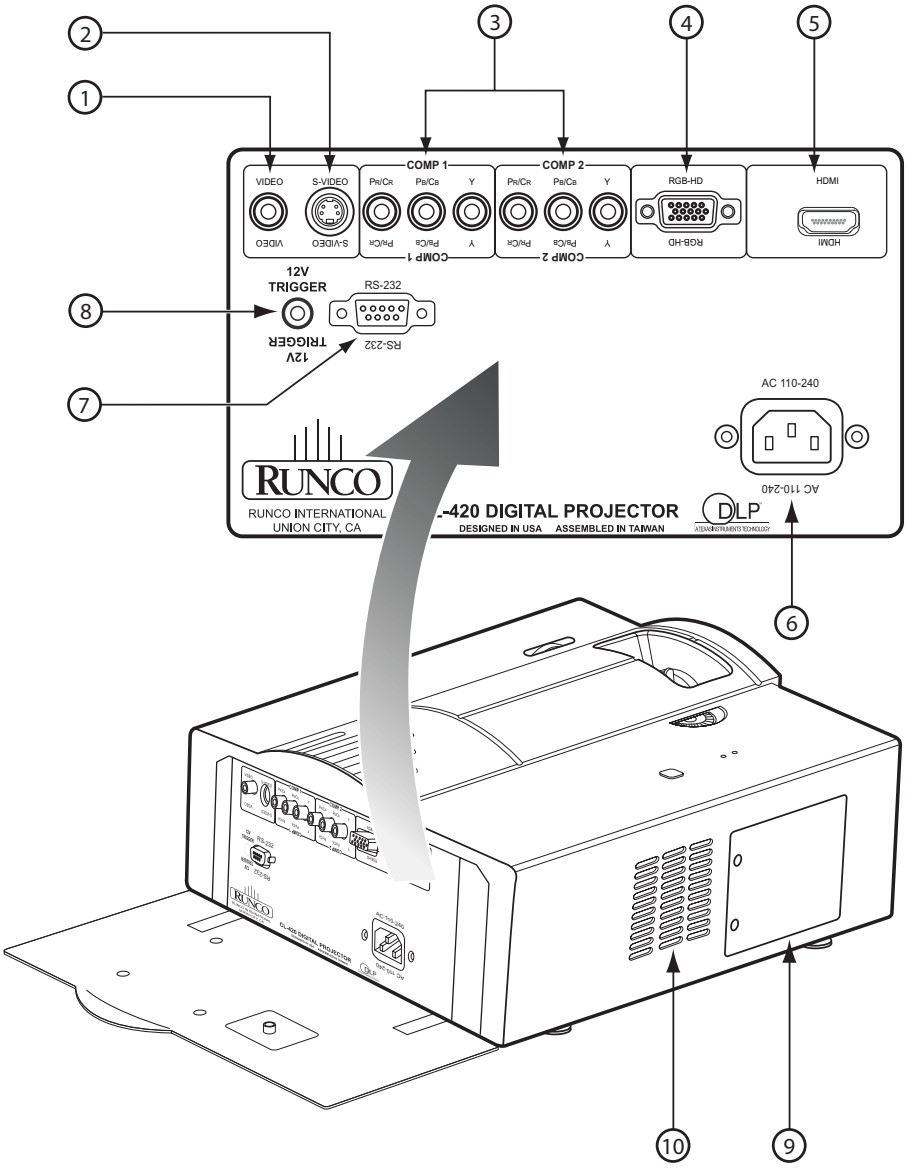



**Figure 2-2. CL-410/CL-420 Rear/Top/Side View**

1. **COMPOSITE VIDEO INPUT**
   Standard composite video input for connecting a VCR, camcorder, laser disc player or other composite video source.
2. **S-VIDEO**
   Standard S-Video input for connecting a DVD player, satellite receiver or Super VHS (S-VHS) VCR.
3. **COMPONENT VIDEO (RCA connectors)**
   Standard-definition (480i/576i) or high-definition (720p/1080i), YPrPb component input. This is the input for component video from sources such as DVD players.

*For best results, do not run your DVD player in progressive mode.*

4. **RGB HD**
   A 15-pin VGA connection to a personal computer or HD tuner with an RGB output. The CL-410/CL-420 automatically detects the signal resolution: 480p, 576i, 720p or 1080i.
5. **HDMI / Computer Input (Digital)**
   HDCP-compliant digital video input for connecting a DVD player, personal computer or HD tuner with a DVI or HDMI output.
6. **POWER INPUT (100 to 240 VAC)**
   Connect the CL-410/CL-420 to power here.
7. **RS-232 CONTROL PORT**
   A female, 9-pin D-sub connector for interfacing with a PC or home theater automation/control system.
8. **12-VOLT TRIGGER (3.5-mm mini phono jack; Tip = +12V; Sleeve = Ground)**
   For connecting to retractable screens or other devices that respond to 12-volt triggers. Outputs +12 volts / 250 milliamps when the projector is turned on.
9. **LAMP COVER**
10. **EXHAUST VENT**

## 2.2 CL-410/CL-420 Remote Control

Figure 2-3 shows the CL-410/CL-420 remote control, and the paragraphs that follow describe its functionality.

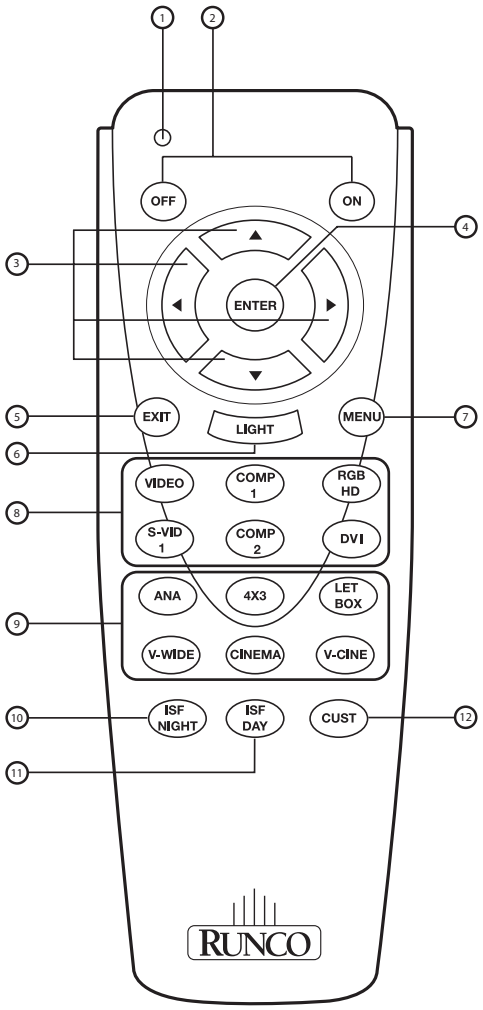



**Figure 2-3. CL-410/CL-420 Remote Control**

1. **IR OUTPUT INDICATOR**
   Lights when a button is pressed to indicate that an IR signal is being transmitted.
2. **ON / OFF**
   Press to turn the projector on or off.
3. **Cursor Keys (▲, ◀, ▼, ▶)**
   Use these buttons to select items or settings, adjust settings or switch display patterns.
4. **ENTER**
   Press to select a highlighted menu item or confirm a changed setting.
5. **EXIT**
   Press this button to exit the current menu and return to the previous one.

6. **LIGHT**
   Press this button to illuminate the buttons.
7. **MENU**
   Press this button to access the on-screen display (OSD) controls.
8. **Source Selection Buttons:**

   **VIDEO**
   Press to switch to the Composite video input.

   **COMP 1 (Component 1)**
   Press to switch to the Component 1 (480i/576i/720p/1080i) video input.

   **RGB HD**
   Press to switch to the RGB HD input.

   **S-VID 1 (S-Video)**
   Press to switch to the S-Video input.

   **COMP 2 (Component 2)**
   Press to switch to the Component 2 (480i/576i/720p/1080i) video input.

   **DVI**
   Press to switch to the Digital Video (HDMI) input.
9. **Aspect Ratio Selection Buttons:**

   **ANA (Anamorphic)**
   For viewing 16:9 DVDs or HDTV programs in their native aspect ratio.

   **4X3 (Standard 4:3)**
   Scales the input signal to fit 4:3 display mode in the center of the screen.

   **LETBOX (Letterbox)**
   For viewing LaserDisc movies or non-anamorphic DVDs on a 4:3 screen.

   **V-WIDE (VirtualWide)**
   Enlarges a 4:3 image horizontally in a NON-linear fashion to fit 16:9 full screen display.

   **CINEMA**
   For viewing 2.35:1 source material on a 1.78:1 (16:9) screen. The upper and lower portions are masked.

   **V-CINE (Virtual Cinema)**
   A 2.35 image is stretched vertically in both directions to fill a 16:9 image.

**Memory Preset Buttons:**

10. **ISF NIGHT**
    Press to recall settings for the current input from the “ISF Night” memory preset.
11. **ISF DAY**
    Press to recall settings for the current input from the “ISF Day” memory preset.
12. **CUST**
    Press to recall settings for the current input from the “Custom” memory preset.

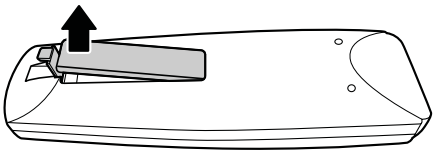
## Notes:

# 3. Installation

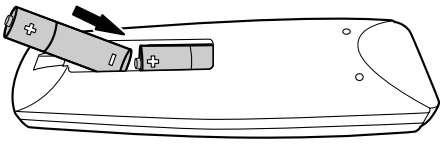
## 3.1 Remote Control

To install batteries in the remote control:

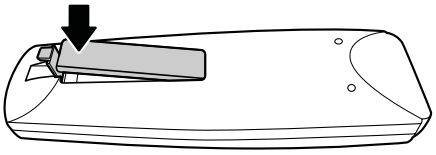
1. Press down the tab on the cover and pull the cover in the direction of the arrow.



2. Insert the included batteries. Ensure that the polarities correctly match the ⊕ and ⊖ markings inside the battery compartment.



3. Insert the lower tab of the cover into the opening, and press down the cover until it clicks in place.



◄ ***Notes on Batteries***

- When installing batteries, make sure that the battery polarities are correct.
- Do not mix an old battery with a new one or different types of batteries.
- If you will not use the remote control for a long time, remove the batteries to avoid damage from battery leakage.

### Notes on Remote Control Operation ➤

The remote control can be used to control the projector within the ranges shown in Figure 3-1.

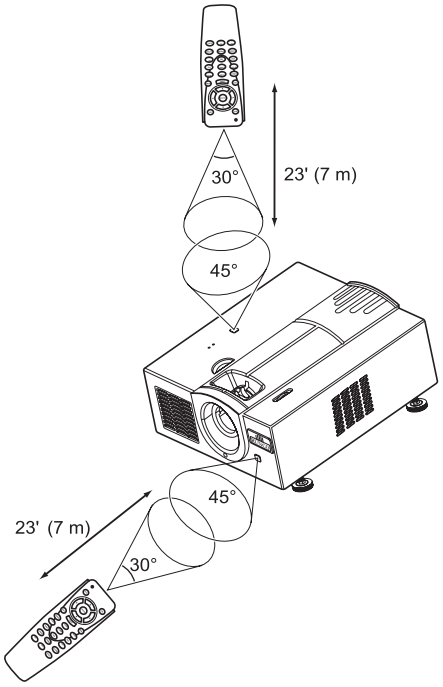



**Figure 3-1. Available Range of the Remote Control**

***Note*** *The signal from the remote control can be reflected by the screen or other surfaces.*

- For best results, hold the remote control within 23 feet (7m) of the back or top sensor and aligned within 30°.
- Do not drop the remote control or expose it to moisture or high temperature.
- The remote control may malfunction under a fluorescent lamp. If that occurs, move the projector away from the fluorescent lamp.
- Make sure that there is nothing obstructing the infrared beam between the remote control and the IR receiver on the projector.
- If the effective range of the remote control decreases, or it stops working, replace the batteries with new ones.
- Ambient conditions may possibly impede the operation of the remote control. If this happens, point the remote control at the projector, and repeat the operation.

## 3.2 Quick Setup

Table 3-1 gives a quick overview of the CL-410/CL-420 installation process. The sections following this one provide detailed instructions.

***Note***

*Installation should be performed by a qualified custom video installation specialist.*

### Table 3-1. Installation Overview

| Step | Procedure | For Details, refer to page... |
|---|---|---|
| 1 | Choose a location for the projector | 14 |
| 2 | Connect signal sources to the projector | 20 |
| 3 | Connect external controller to RS-232 port (optional) | 25 |
| 4 | Apply power to the projector | 27 |
| 5 | For rear-screen and/or ceiling-mount installations, select the proper picture orientation | 28 |
| 6 | Lens adjustments: projected image size (zoom), position (shift) and focus | 16, 29 |
| 7 | Projector calibration: adjust the following ***for each input***, starting with Component SD; save settings when finished:<br>• Aspect ratio<br>• Brightness<br>• Contrast<br>• Color level<br>• Tint<br>• Input position | 32 through 41 |

## 3.3 Installation Considerations

Proper installation of your projector will ensure the quality of your display. Whether you are installing a projector temporarily or permanently, you should take the following into account to ensure your projector performs optimally.

***Installation Type*** ➤ Choose the installation type that best suits your needs: front or rear screen, floor mount or inverted mount. Table 3-2 compares these various installation methods.

### Table 3-2. Projector Installation Options

| Advantages | Considerations |
|---|---|
| **Front Screen, Floor Mount Installation** | |
| • Easy to set up<br>• Can be moved or changed quickly<br>• Easy to access | • Shares floor space with audience |
| **Front Screen, Inverted Mount (ceiling) Installation** | |
| • Does not take up audience space<br>• Projector is unobtrusive<br>• Projector cannot be accidentally moved | • Installation is more permanent<br>• Projector access is more difficult |
| **Rear Screen, Floor Mount Installation** | |
| • Projector is completely hidden<br>• Projector is easily accessed<br>• Usually good ambient light rejection | • Requires separate room<br>• Installation cost is usually higher |
| **Rear Screen, Inverted Mount (ceiling) Installation** | |
| • Projector is completely hidden<br>• Usually good ambient light rejection | • Requires separate room<br>• Installation cost is usually higher |
| **Rear Screen, Floor Mount with Mirror** | |
| • Projector is completely hidden<br>• Usually good ambient light rejection<br>• Requires less space behind screen than other rear screen installations | • Requires separate room<br>• Installation cost is usually higher |

***Ambient Light*** ➤ In general, minimize or eliminate light sources directed at the screen. Contrast ratio in your images will be noticeably reduced if light directly strikes the screen, such as when a shaft of light from a window or floodlight falls on the image. Images may then appear washed out and less vibrant.

***Other Considerations*** ➤ Other considerations and tips that can help improve your installation:

- Keep the ambient temperature constant and below 35°C (95°F). Keep the projector away from heating and/or air conditioning vents. Changes in temperature may cause drifts in the projector circuitry, which may affect performance.
- Keep the projector away from devices that radiate electromagnetic energy such as motors and transformers. Common sources of these include slide projectors, speakers, power amplifiers and elevators.

## ◄ *Throw Distance*

Throw distance is the distance measured from the front of the projector to the screen. This is an important calculation in any projector installation as it determines whether or not you have enough room to install your projector with a desired screen size and if your image will be the right size for your screen.

You can quickly estimate the throw distance by taking the width of the screen and multiplying it by the lens throw ratio; see Figure 3-2.

**The CL-410 has a lens throw ratio of between 1.37 and 1.67.**

**The CL-420 has a lens throw ratio of between 1.40 and 1.70.**

The result of this calculation tells you roughly how far back the projector should be positioned from the screen in order to project a focused image large enough to fill the screen.

For example, with an 8-foot (96-inch) wide screen:

- The CL-410 has a throw distance range of between 131.5 inches (3.34 meters) and 160.3 inches (4.07 meters).
- The CL-420 has a throw distance range of between 134.4 inches (3.41 meters) and 163.2 inches (4.14 meters).

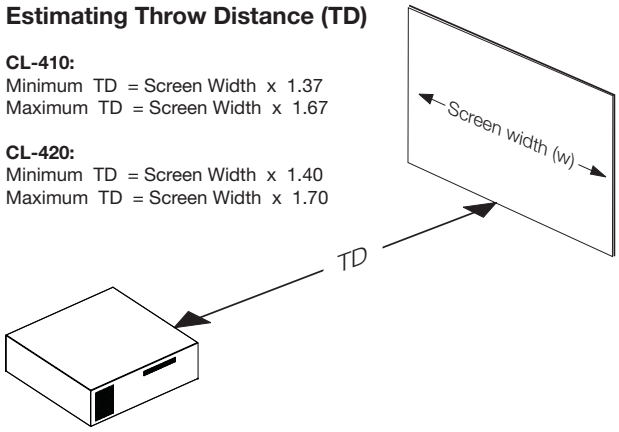

Estimating Throw Distance (TD)
CL-410:
Minimum TD = Screen Width x 1.37
Maximum TD = Screen Width x 1.67
CL-420:
Minimum TD = Screen Width x 1.40
Maximum TD = Screen Width x 1.70
Screen width (w)
TD

**Figure 3-2. Estimating Throw Distance**

### Vertical and Horizontal Position

Proper placement of the projector relative to the screen will yield a rectangular, perfectly-centered image that completely fills the screen.

Ideally, the projector should be positioned perpendicular to the screen and in such a way that the lens center and screen center are aligned with each other, as shown in Figure 3-3.

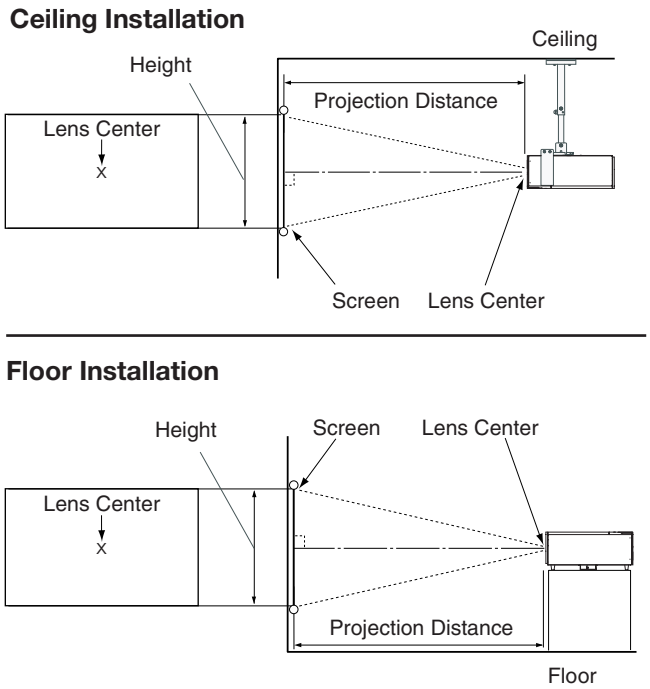
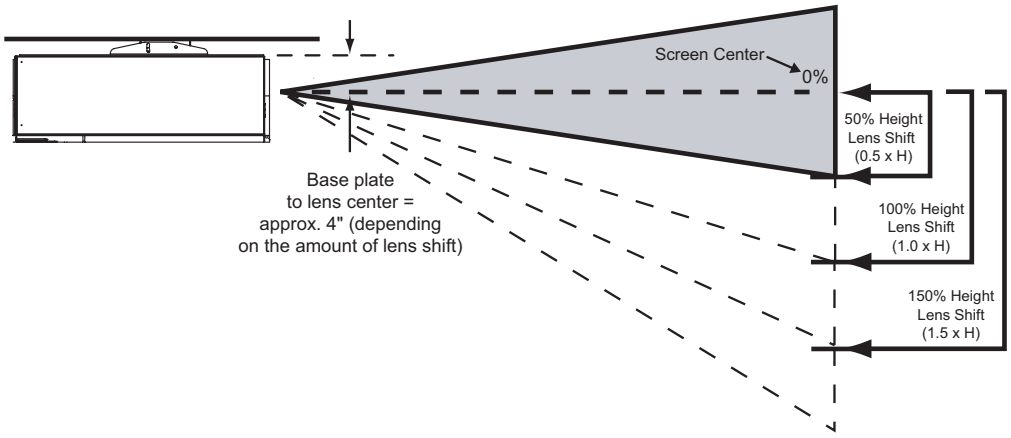



**Figure 3-3. Projector Placement**

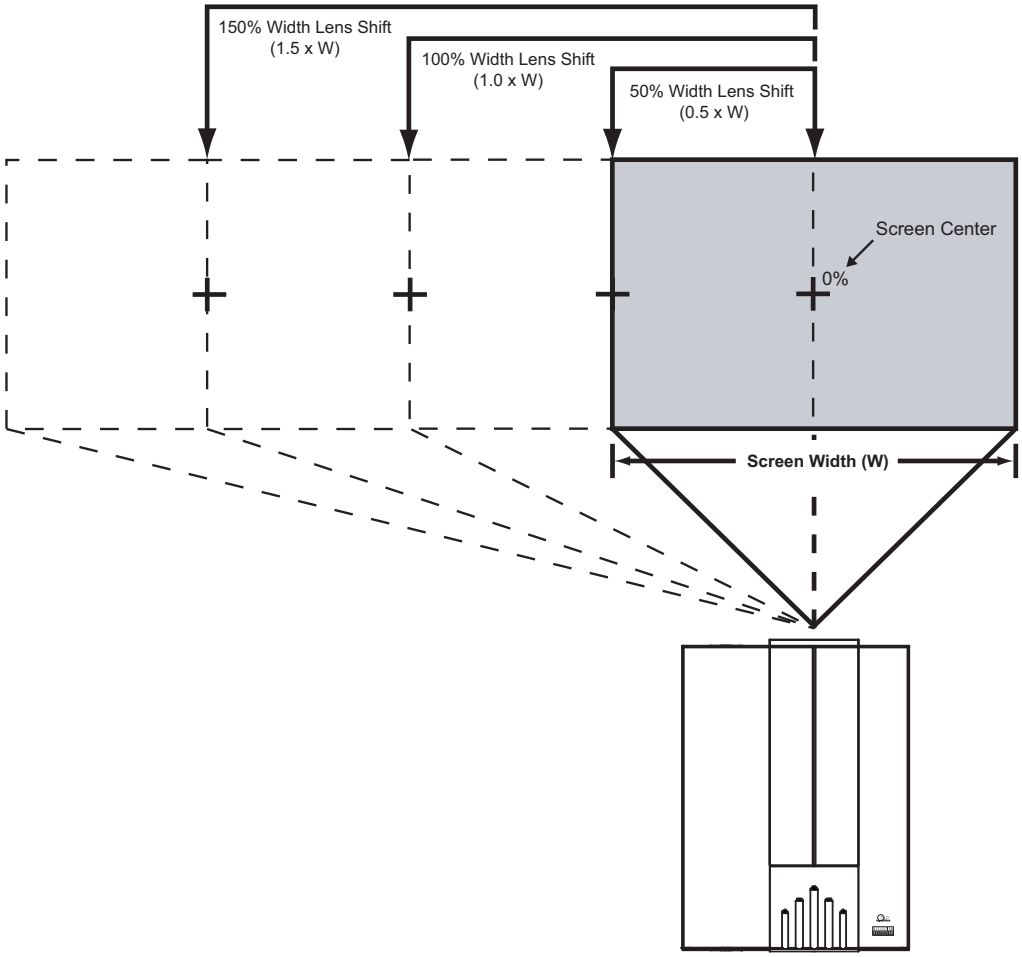
### Vertical and Horizontal Lens Shift

If it is not possible to align the projector and screen as shown in Figure 3-3, you can use the lens shift controls to center the image on the screen. Lens shift is generally expressed as a percentage of the screen height or width, as shown in Figure 3-4 and Figure 3-5.




***Note:*** *This is a general example of lens shift. Lenses vary in their shift capabilities.* ***No particular lens or projector is shown in this example.***

**Figure 3-4. Vertical Lens Shift (Example only)**




***Note:*** *This is a general example of lens shift. Lenses vary in their shift capabilities.* ***No particular lens or projector is shown in this example.***

**Figure 3-5. Horizontal Lens Shift (Example only)**

Table 3-3 gives the lens shift limits for the CL-410 and CL-420, as percentages and absolute measurements with a 96 x 54 inch (1.78:1) screen.

### Table 3-3. Vertical and Horizontal Lens Shift Limits

| | | CL-410 | CL-420 |
|---|---|---|---|
| **Lens Shift Limits, as Percentages of Screen Height or Width (Notes 1 and 2)** | | | |
| Vertical (Notes 2 and 3) | Up | 40% | 46% |
| | Down | 60% | 63% |
| Horizontal (Note 2) | Left | 8% | |
| | Right | 8% | |
| **Lens Shift Limits in Inches, with a 96-by-54 inch (1.78:1) Screen** | | | |
| Vertical | Up | 21.60 | 24.84 |
| | Down | 32.40 | 34.02 |
| Horizontal | Left | 7.68 | |
| | Right | 7.68 | |

***Notes:***

1. *With no vertical or horizontal lens shift, the lens center and screen center are aligned with each other.*
2. *Vertical shift limits are percentages of the screen height. Horizontal shift limits are percentages of the screen width.*
3. ***Vertical lens shift figures apply to ceiling mount configurations.*** *For floor installations (where the projector is upright), reverse the up/down vertical offset percentages.*

### *Adjusting the Projection Angle*

If the screen is significantly higher or lower than the projector, you can also tilt the projector at a slight angle. In a ceiling installation, you do this by adjusting the ceiling mount. For a floor installation, turn the four adjustable feet on the bottom of the projector to adjust the projector height and/or projection angle.

If you do this, you may need to shift the image or apply keystone correction using the on-screen display (OSD) controls, to compensate. For detailed instructions, refer to ***Using the On-Screen Menus*** on page 30.

## ➤ *Mounting*

There are several methods for mounting the projector. Depending on your chosen installation, one method may be more suitable than another.

**Floor Mounting:** In typical front and rear screen installations the projector can be mounted to a secure and level surface, such as a table or cart. Carts are useful when moving a projector during a presentation or from site to site. If possible, lock the wheels when it's in position to prevent it from being moved during a presentation.

**Ceiling Mounting:** The projector can also be inverted and suspended from the ceiling using a specially designed ceiling mount fixture. This type of mounting is recommended for fixed installations and for those that want the projector out of sight or have a limited space for projector and audience.

***Note***

*Use only the Runco-approved ceiling mount kit designed for your projector.*

## ➤ *Folded Optics*

In rear-screen applications where space behind the projector is limited, a mirror may be used to fold the optical path, as shown in Figure 3-6. The position of the projector and mirror must be accurately set. If you are considering this type of installation, contact your dealer for assistance.

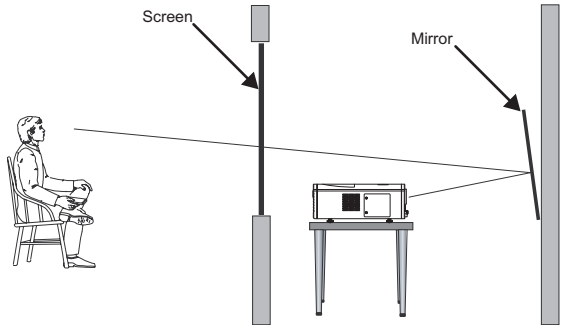



**Figure 3-6. Folded Optics**

## 3.4 Connections to the CL-410/CL-420

Proceed as follows to connect the CL-410/CL-420 to your video sources, external controller(s) -- if present -- and AC power.

When connecting your equipment:

- Turn off all equipment before making any connections.
- Use the correct signal cables for each source.
- Ensure that the cables are securely connected. Tighten the thumbscrews on connectors that have them.

### *Connector Panel Access*

To access the connector panel, pull firmly on the cable access cover to open it.

### *Connecting the CL-410/CL-420 to Source Components*

Connect your video sources to the CL-410/CL-420 as shown and described in the sections that follow.

**HDMI Connections:** The CL-410/CL-420 has an HDMI input for connecting a DVD player, DTV decoder, personal computer or any other device with a DVI or HDMI output. Connect such devices as shown in Figure 3-7.

***Tip***

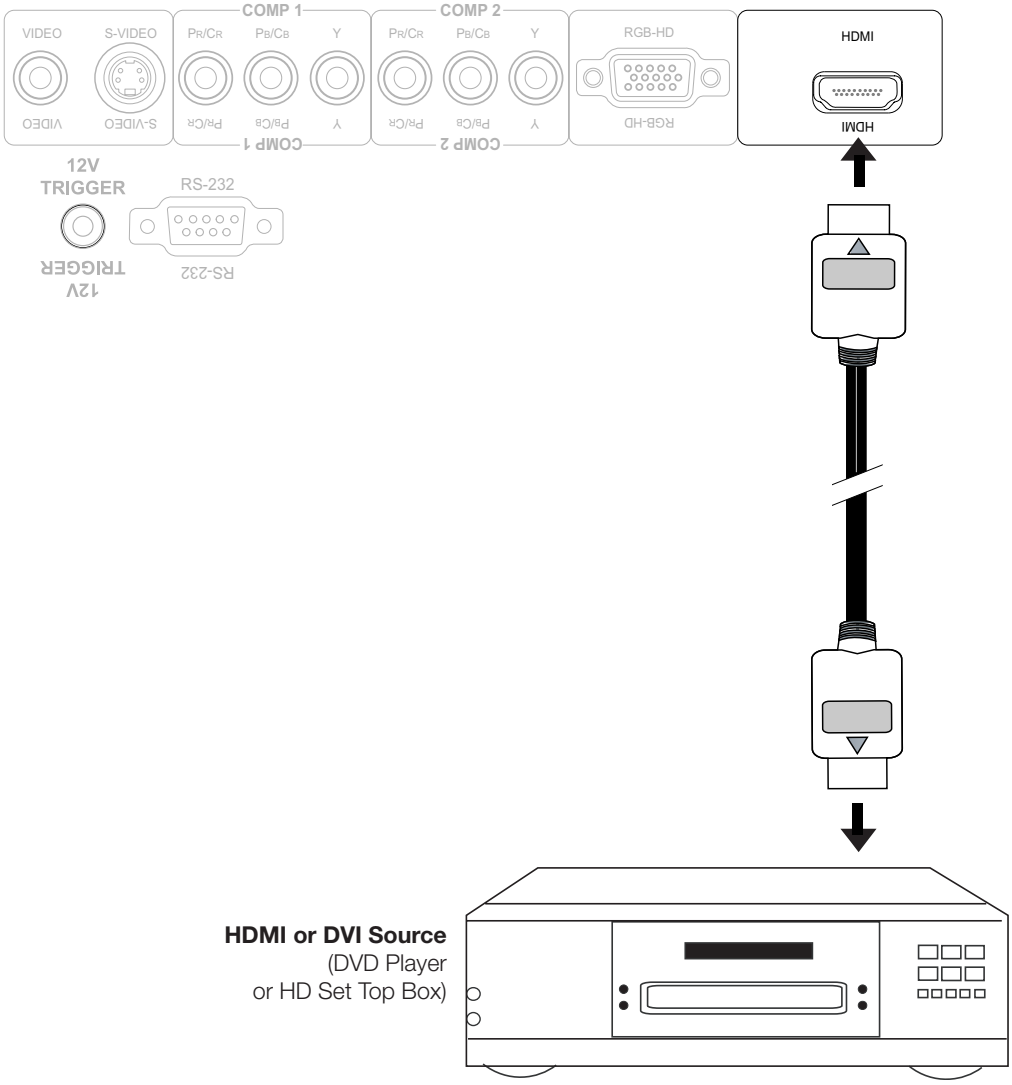
*Use the HDMI input whenever possible. This ensures the highest video quality because the signal is carried in the digital domain throughout the entire signal path, from source component output into the projector.*

***Note***

*To connect a DVI component, use the DVI-to-HDMI adapter and cable provided with the projector.*

*The CL-410/CL-420 supports the VESA Display Data Channel (DDC) standard. This standard provides "Plug and Play" capability; the projector and a VESA DDC-compatible computer communicate their setting requirements, allowing for quick and easy setup.*

*In order for Plug and Play to work correctly, you must turn on the projector before you turn on the connected computer.*




***Note:*** *To connect a DVI source, use the HDMI-to-DVI adapter and DVI cable provided with the projector.*

**Figure 3-7. HDMI (or DVI) Source Connections**

**RGB-HD Connections:** The CL-410/CL-420 has an RGB input for connecting a personal computer or DTV decoder with an RGB output. See Figure 3-8.

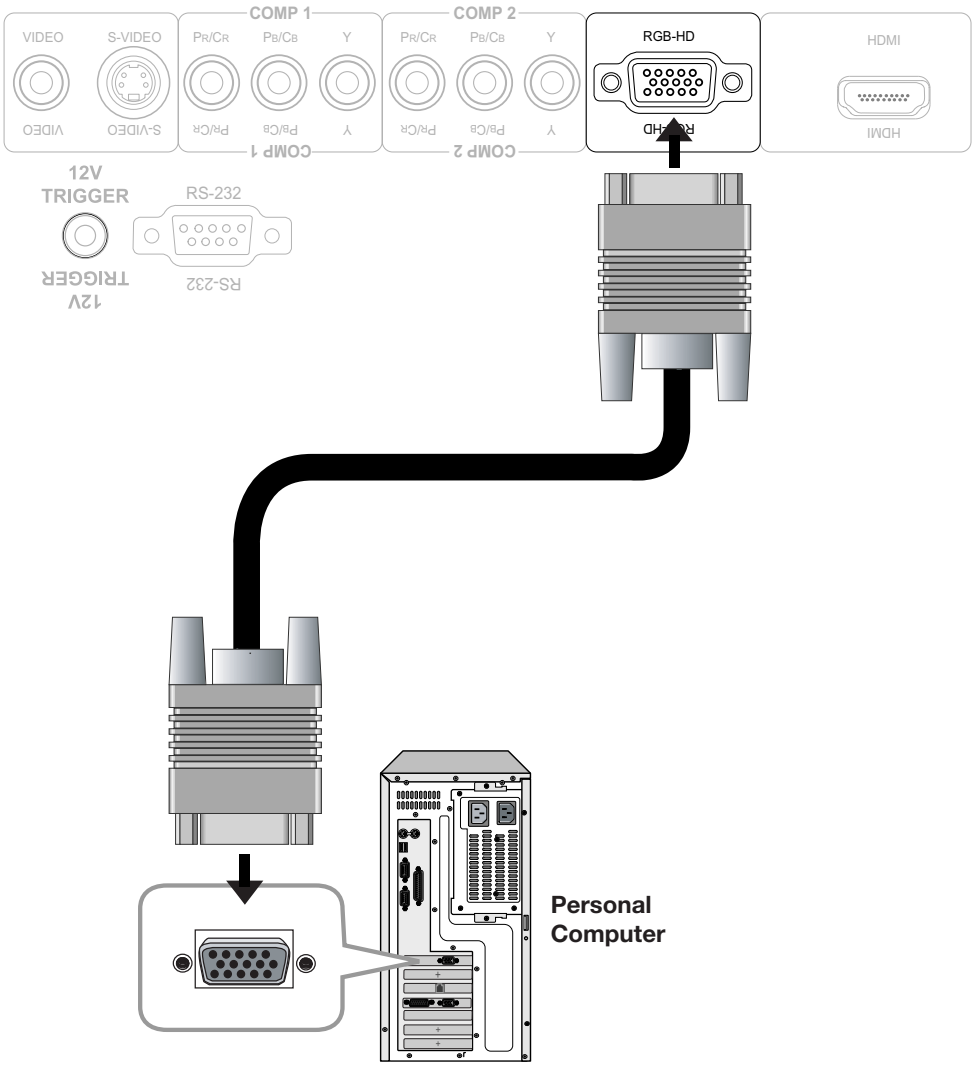



**Figure 3-8. Analog RGB Connections**

***Note***

1. *Refer to **Computer Signal Compatibility** on page 58 for a list of computer signals compatible with the CL-410/CL-420. Use with signals other than those listed may cause some functions not to work.*
2. *Some Macintosh computers may require a Macintosh video adapter. Contact your nearest authorized service center or dealer.*
3. *This CL-410/CL-420 may not be able to display images from notebook computers in simultaneous (CRT/LCD) mode. Should this occur, switch the notebook computer to "CRT only" mode. If you are unsure how to do this, refer to your notebook computer's user manual.*

**Component Video Connections:** If you have a DVD player or DTV decoder with a component (YPbPr) output, connect it to the COMP 1 or COMP 2 input as shown in Figure 3-9.

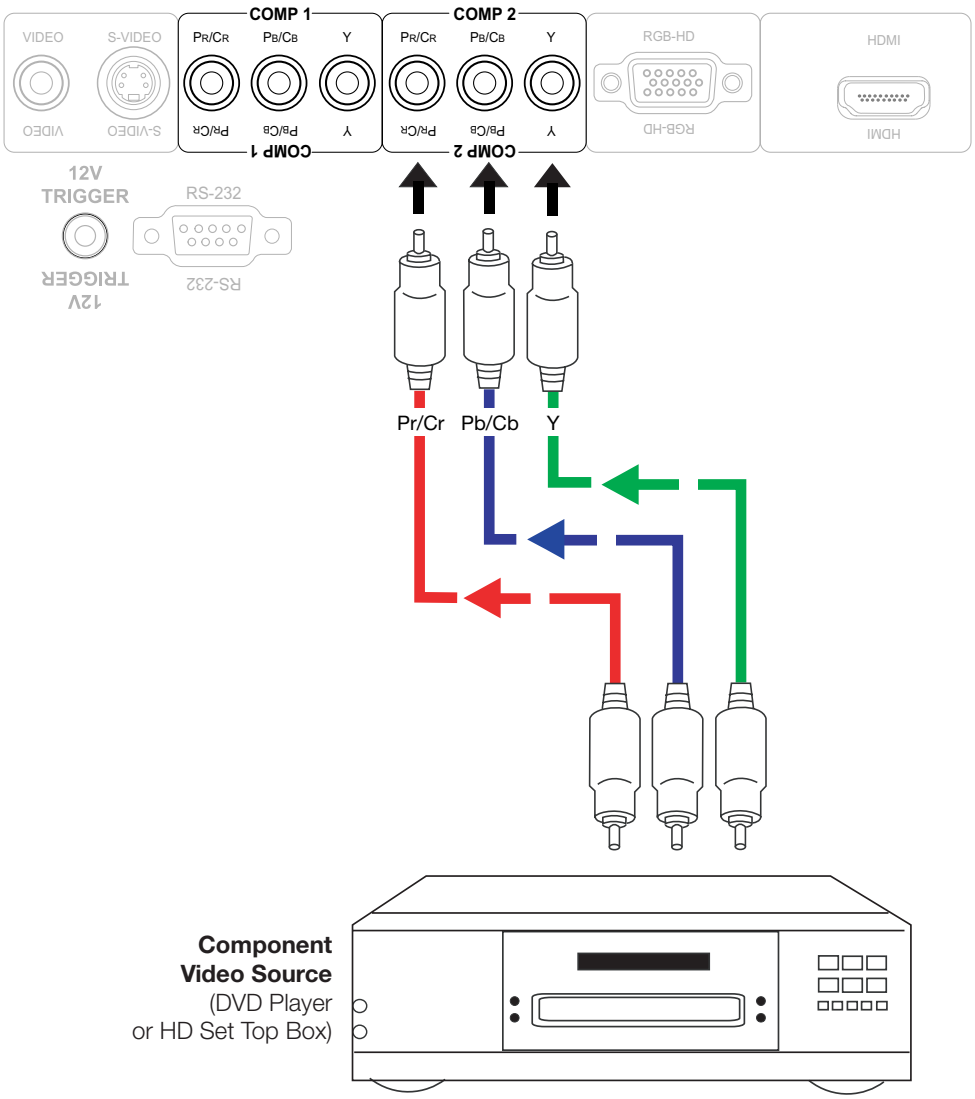



**Figure 3-9. Component Video Connections**

**Composite/S-Video Connections:** The CL-410/CL-420 has S-Video and composite video inputs for connecting a DVD player, VCR, satellite receiver, camcorder, laser disc player et cetera; see Figure 3-10.

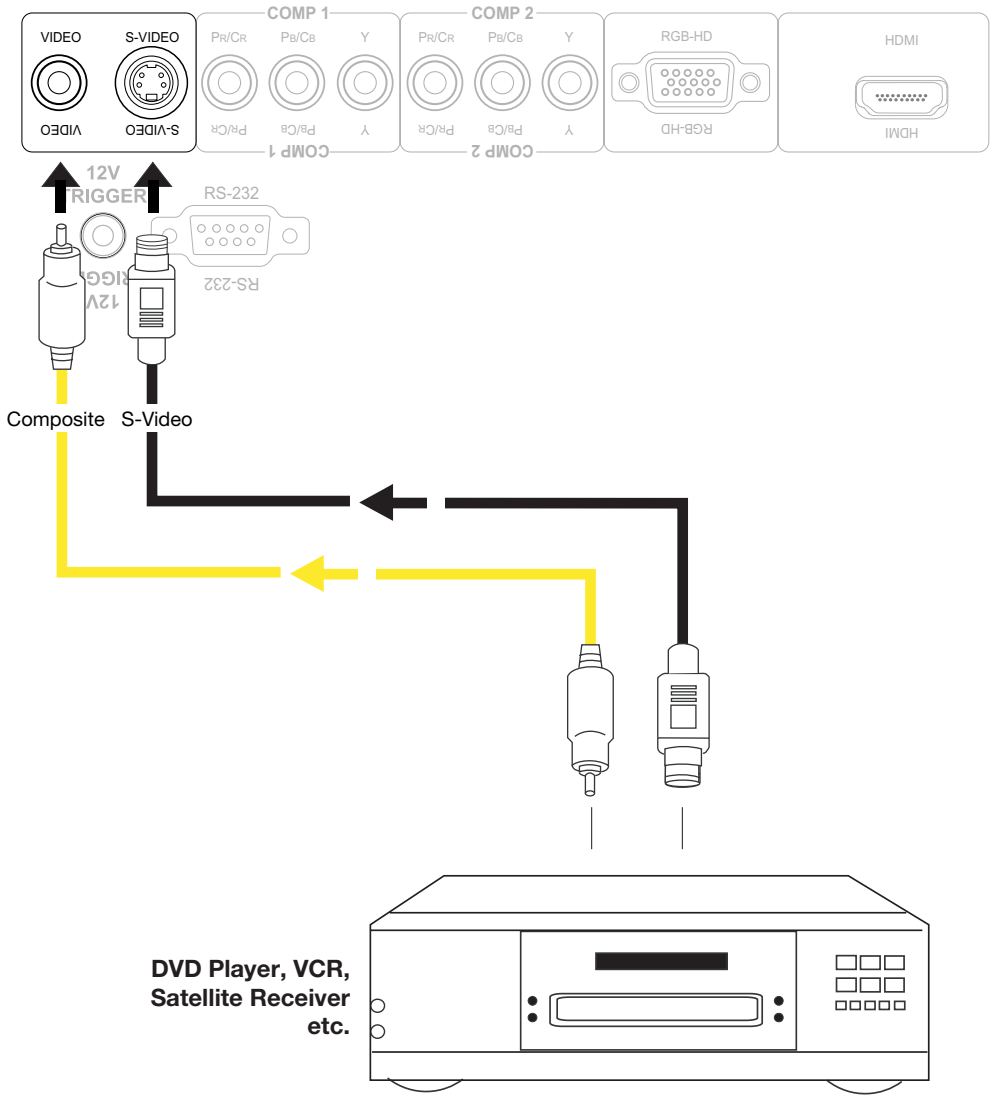



**Figure 3-10. Composite and S-Video Connections**

### ◄ *RS-232 Controller Connection*

Use a standard, 9-pin RS-232 cable to connect a PC or home theater control/automation system (if present) to the RS-232 port on the CL-410/CL-420; see Figure 3-11.

For more information about using this connection, refer to ***Serial Communications*** on page 53.

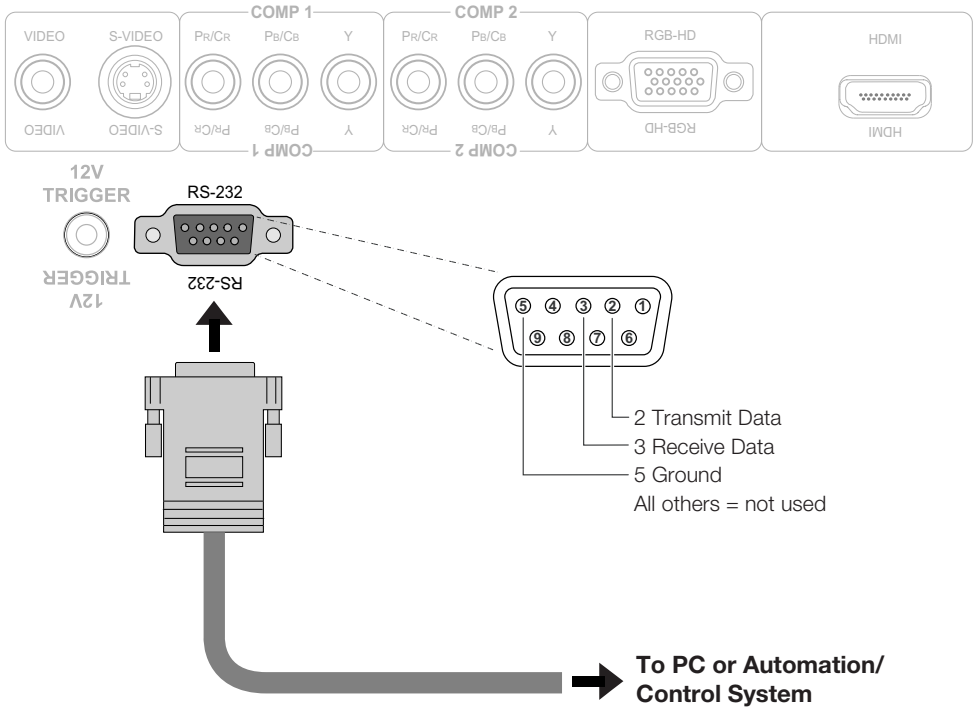



**Figure 3-11. RS-232 Control System Connection**

### Connecting to the 12-Volt Trigger Output ➤

If your home theater contains a retractable screen or other, 12-Volt trigger-activated equipment, connect it to the 12-volt trigger output on the CL-410/CL-420 as shown in Figure 3-12.

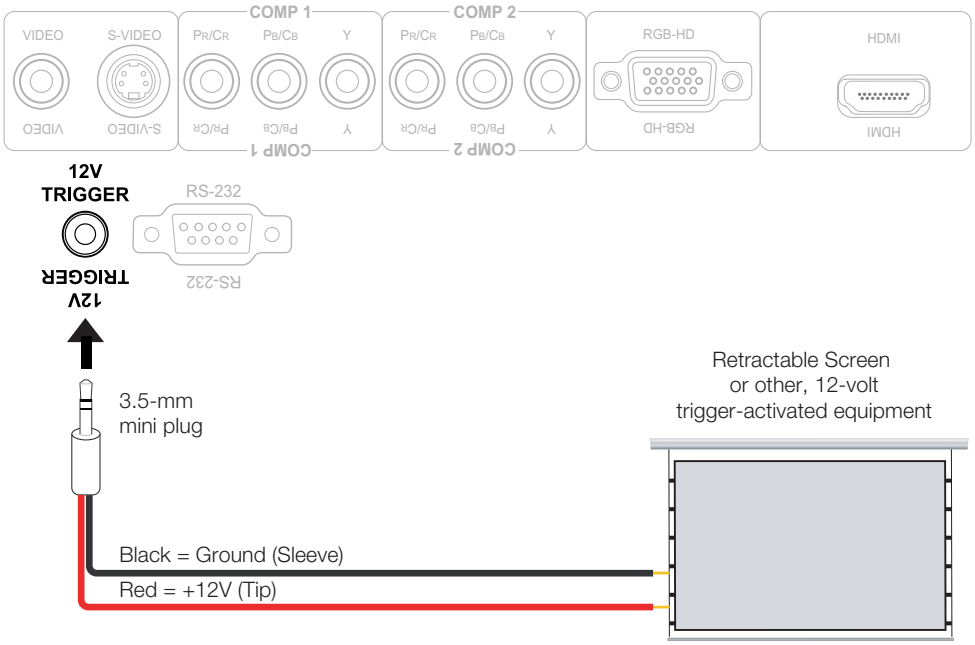
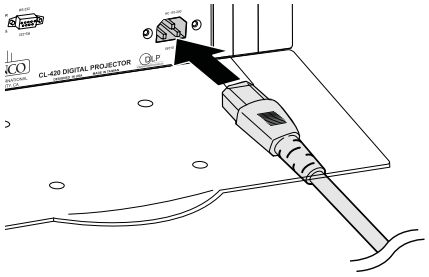



**Figure 3-12. Connecting the 12-Volt Trigger Output**

# 4. Operation

## 4.1 Turning on the Power

1. Turn on your source components.
2. Plug the female end of the power cord into the AC receptacle on the rear of the CL-410/CL-420 (AC 100V ~ 240V).
3. Connect the other end to your AC power source. The power indicator lights blue to indicate that the CL-410/CL-420 is in “standby” mode.
4. Press the **ON** button on the remote control to turn on the projector. The power indicator turns off.
5. After a brief warm-up period (approximately 10 seconds), the CL-410/CL-420 will start projecting.




## 4.2 Adjusting the Projector Height or Projection Angle

When the CL-410/CL-420 is installed upright, you can adjust the projector height or projection angle by turning the four adjustable feet on the bottom of the projector; see Figure 4-1. This is useful for correcting the angle of projection when the projector is placed on an uneven surface or when the screen is at an angle. You can tilt the projector up to five (5) degrees up or down by adjusting the feet.

The feet are connected to threaded bolts; turn them clockwise to raise the projector or counterclockwise to lower it.

***Note*** *Tilting the projector may cause keystone distortion. To correct this, refer to* ***Keystone Correction*** *on page 43.*

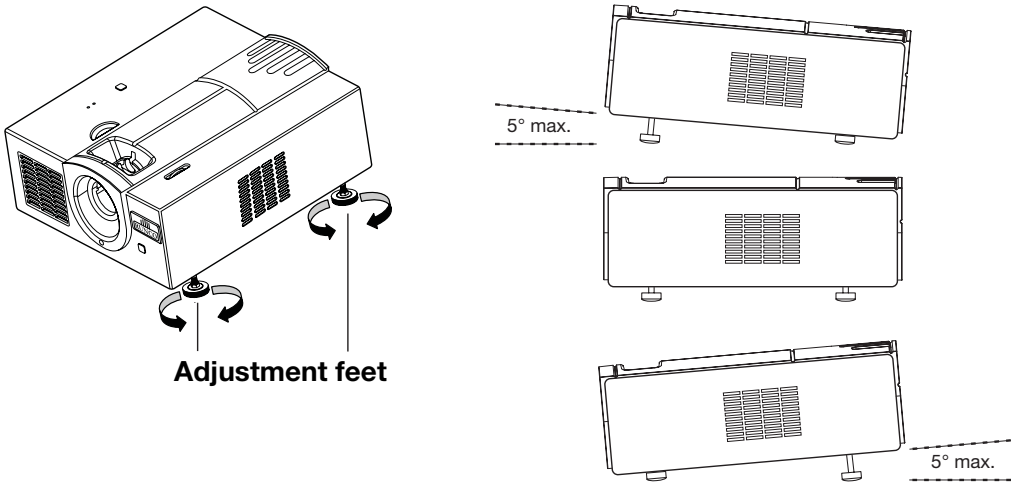



**Figure 4-1. Adjusting the Feet**

## 4.3 Changing the OSD Language

The CL-410/CL-420 OSD language is initially set to English, but can also display the menus in French, Italian, German or Spanish. To change the OSD language:

1. Press **MENU**.
2. Select **Installation** from the Main Menu.
3. Select **Language** from the Installation Menu.
4. Press ◀ or ▶ to select the desired language. The change takes effect immediately.

## 4.4 Adjusting the Picture Orientation

By default, the CL-410/CL-420 is configured for a “floor/front” installation, in which the projector is installed upright and in front of the screen. If it is installed behind the screen and/or mounted on a ceiling, you must change the picture orientation. To do this:

1. Press **MENU**.
2. Select **Installation** from the Main Menu.
3. Select **Picture Configuration** from the Installation Menu.
4. Choose Floor Rear, Ceiling Front or Ceiling Rear, to match the installation method.

## 4.5 Lens Adjustments

➤ ***Focus/Zoom***

The CL-410/CL-420 gives you a great deal of control over the picture size, position and focus. Figure 4-2 shows the location of the focus and zoom controls; Figure 4-3 shows the location of the lens shift controls.

To focus the projected image, rotate the focus ring left or right.

To make the picture larger (zoom in), rotate the zoom ring to the left, toward the Runco logo. To make the picture smaller (zoom out), rotate the zoom ring to the right.

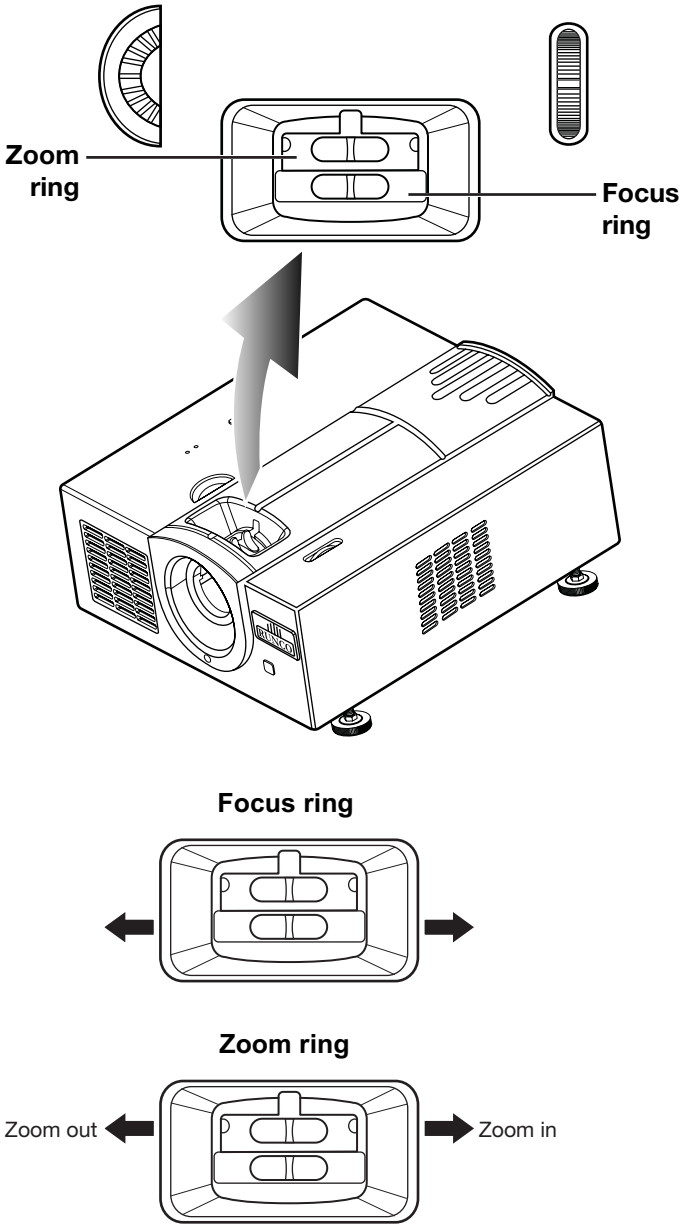



**Figure 4-2. Focus and Zoom Controls**

***Shift*** ➤ To change the projected image position, rotate the vertical and/or horizontal lens shift dials.

***Caution*** *Do not force the lens shift dials beyond their respective ranges. This may cause the projector to malfunction.*

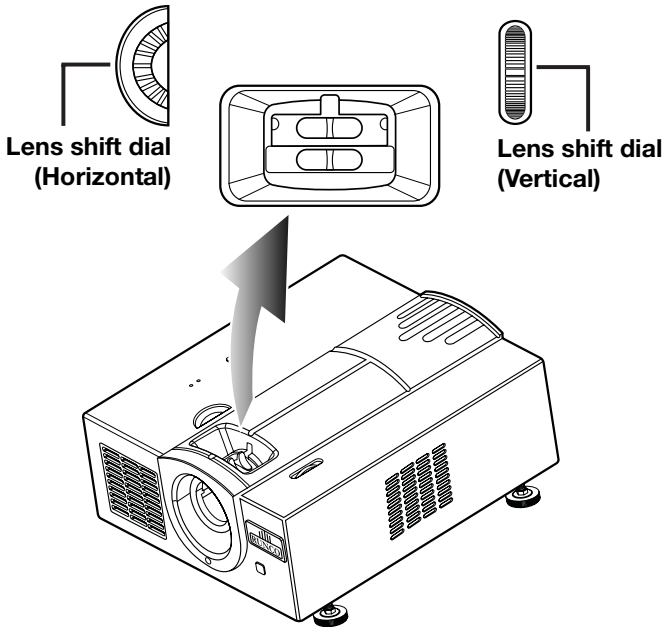



**Figure 4-3. Vertical and Horizontal Lens Shift Controls**

## 4.6 Using the On-Screen Menus

To use the on-screen menus:

1. Press **MENU** to display the Main Menu.
2. To select a menu item, use the up- or down-arrow buttons ( ▲, ▼ ) on the remote control to highlight it.
3. Press the right- or left-arrow button ( ◀ or ▶, depending on the OSD position) to access that menu.
4. Use the up- or down-arrow buttons ( ▲, ▼ ) to select the setting you want to change.
5. Press the right- or left-arrow button ( ◀, ▶ ) to change that setting;

   -- OR --

   With some settings, you can press **ENTER** to hide the OSD menus and display a slidebar for that setting only. Then, press the right- or left-arrow button (◀, ▶ ) to change it.
6. To return to the previous menu, press **EXIT**.

The CL-410/CL-420 OSD menus are arranged hierarchically, as shown in Figure 4-4. Depending on the selected input source, some menu options may not be available.

| | | |
|---|---|---|
| **Picture Adjust** | Brightness | |
| | Contrast | |
| | Color | (not available on HDMI or RGB-HD inputs) |
| | Tint | |
| | Sharpness | 1, 2, 3, 4, 5 |
| | Gamma | 1.0, 1.5, 1.8, 2.0, 2.2, 2.35, 2.5, 2.8 |
| | Color Temp | 5,000K, 5,500K, ... 10,000K |
| | ICC Select | Standard, NTSC, HDTV, PAL |
| | White Balance | R/G/B Gain |
| | | R/G/B Offset |
| | Save Settings | |
| | Restore Picture Settings | Custom 1, ISF Day, ISF Night |
| **Source Select** | Video | |
| | S-Video | |
| | Component 1 | |
| | Component 2 | |
| | RGB-HD | |
| | HDMI/DVI | |
| **Aspect Ratio** | Anamorphic (16/9) | |
| | Standard (4/3) (not available with HD signals) | |
| | LetterBox | |
| | VirtualWide | |
| | Cinema | |
| | Virtual Cinema | |
| **Image Option** | HD/RGB Adjust (available only when RGB-HD input is selected) | Clock |
| | | Phase |
| | | Reset |
| | | Execute Auto Tune |
| | | Auto Tune |
| | Image Position (not available on HDMI input) | H Position |
| | | V Position |
| | | Reset |
| | Over Scan Adjust | 0% to 10% |
| | SDTV Adjust (not available on HDMI or RGB-HD inputs) | Chroma Enhance |
| | | Video On Film (on/off) |
| | | Film Mode |
| | Brightness Enhance | (on/off) |
| | Lamp Power | 200W or 250W |
| | Information (read-only) | source, resolution, V Frequency, H Frequency, Lamp Timer, firmware version |
| | Restore Factory Settings | |
| **Installation** | Language | English, French, Italian, German or Spanish |
| | Picture Configuration | Floor Front, Ceiling Rear, Floor Rear or Ceiling Front |
| | OSD Timeout | 5 secs., 15 secs. or 60 secs. |
| | OSD Transparent | (on/off) |
| | Source Detect | Auto or Manual |
| | Auto Power Off | (on/off) |
| | Blue Enable | (on/off) |
| | OSD Position | Top Left, Bottom Left, Top Right or Bottom Right |
| | Keystone | V Keystone |
| | | H Keystone |
| | | Reset |
| | Fan High Speed Mode | (on/off) |

| | | |
|---|---|---|
| **ISF Settings** | Brightness | |
| | Contrast | |
| | Color | (not available on HDMI or RGB-HD inputs) |
| | Tint | |
| | Sharpness | 1, 2, 3, 4, 5 |
| | Gamma | 1.0, 1.5, 1.8, 2.0, 2.2, 2.35, 2.5, 2.8 |
| | Color Temp | 5,000K, 5,500K, ... 10,000K |
| | Picture Setting | Custom 1, ISF Day, ISF Night |
| | White Balance | R/G/B Gain |
| | | R/G/B Offset |
| | Save Settings | |
| | Lamp Timer Reset | |
| | ICC Adjust | Standard, NTSC, HDTV, PAL Intensity, Saturation, Hue |
| | ISF Enable | (on/off) |
| | Blue Enable | (on/off) |
| | Splash Screen Timer | 15, 20, 25, 30, ... 60 secs. |
| | Noise Reduction | 0, 1, 2, ... 8 |

**Figure 4-4. CL-410/CL-420 OSD Menu Structure**

### *Main Menu* ➤

The Main Menu is the starting point for accessing all projector functions.

(The ISF Settings menu is grayed out and not accessible until you enter a passcode.)

| Runco CL-420 |
|---|
| **Picture Adjust** |
| **Source Select** |
| **Aspect Ratio** |
| **Image Option** |
| **Installation** |
| **ISF Settings** |

### *Source Select* ➤

From the Main Menu, select Source select to choose a video signal source.

The active source is indicated by an arrow (→) to its left; in the example at left, Video is the active source.

| Source select | |
|---|---|
| → | **Video** |
| | **S-Video** |
| | **Component 1** |
| | **Component 2** |
| | **RGB-HD** |
| | **HDMI/DVI** |

### *Aspect Ratio* ➤

To change the aspect ratio (size and shape) of the projected image, select Aspect Ratio from the Main Menu and press **ENTER**. Select the appropriate aspect ratio for the type of program material being viewed; refer to Table 4-1.

The currently-selected aspect ratio is indicated by an arrow (→) to its left; in the example at left, Anamorphic is selected.

| Aspect Ratio | |
|---|---|
| → | **Anamorphic (16/9)** |
| | **Standard (4/3)** |
| | **LetterBox** |
| | **VirtualWide** |
| | **Cinema** |
| | **Virtual Cinema** |

***Note***

*When you change the aspect ratio, save the change to a preset afterwards. Otherwise, the change will be lost when a different input is selected. (The aspect ratio is saved for each input and resolution separately.) For information about saving settings, refer to* ***Save Settings*** *on page 40.*

## Table 4-1. Aspect Ratio Settings

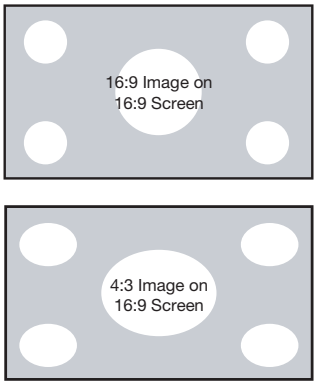
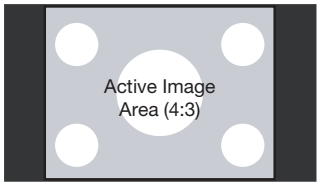
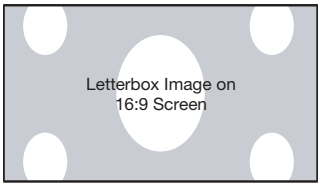
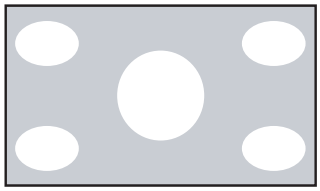
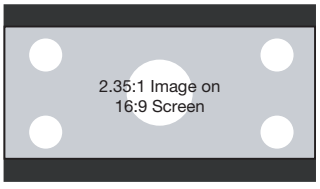
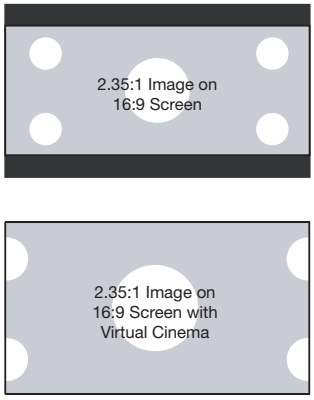
| Aspect Ratio | Remote Control Key | Description | |
|---|---|---|---|
| Anamorphic (16/9) | ANA |  | Select Anamorphic to view 16:9 DVDs and HDTV programs in their native aspect ratio. 4:3 images are stretched horizontally to fit a 16:9 screen. |
| Standard (4/3) | 4X3 |  | Standard 4:3 scales the input signal to fit in the center of the 16:9 screen. 4:3 is the aspect ratio used by computer monitors, standard television programming and most VHS video cassettes.<br><br>This aspect ratio is not available with HD signals. |
| LetterBox | LET BOX |  | In Letterbox mode, the image is stretched vertically; the top and bottom portions are "blanked off." Letterbox is best suited for viewing LaserDisc movies or non-anamorphic DVDs on a 4:3 screen. |
| VirtualWide | V-WIDE |  | A 4:3 image is horizontally scaled in a NON-linear fashion (more on the sides than in the center) to fit a 16x9 screen. |
| Cinema | CINEMA |  | Select Cinema to view 2.35 source material on a 16:9 screen. The upper and lower portions of the screen are masked, but the geometry of the active image area is not changed. |

**Table 4-1. Aspect Ratio Settings (continued)**

| Aspect Ratio | Remote Control Key | Description | |
|---|---|---|---|
| Virtual Cinema | V-CINE |  | A 2.35 image is stretched anamorphically in both directions to fill a 16:9 image. |

***Picture Adjust*** ➤

| Picture Adjust | |
|---|---|
| Brightness | 0 |
| Contrast | 0 |
| Color | 0 |
| Tint | 0 |
| Sharpness | 3 |
| Gamma | 2.2 |
| Color Temp | 6500K |
| ICC Select | Standard |
| White Balance | |
| Save Settings | |
| Restore Picture Settings | |

Use the controls in the Picture Adjust menu to calibrate your CL-410/CL-420 for optimum picture quality.

The CL-410/CL-420 has been designed to incorporate setup and calibration standards established by the Imaging Science Foundation (ISF). The ISF has developed carefully crafted, industry-recognized standards for optimal video performance and has implemented a training program for technicians and installers to use these standards to obtain optimal picture quality from Runco video display devices. Accordingly, Runco recommends that setup and calibration be performed by an ISF certified installation technician.

All signal types require separate processing. Therefore, you need to calibrate each input separately. Runco recommends calibrating the CL-410/CL-420 inputs in the following order:

1. Component 1 / Component 2
2. S-Video
3. Video
4. RGB-HD
5. HDMI

***Note***

*When you change a picture quality setting, save the change to a preset afterwards. Otherwise, the change will be lost when a different input is selected. (Picture quality settings are saved for each input and resolution separately.) For information about saving settings, refer to* ***Installation*** *on page 42.*

Although it may be possible to obtain satisfactory picture quality using the naked eye and regular program material, Runco recommends using the following calibration tools for best results:

- External test pattern source -- Ovation Multimedia, Digital Video Essentials or AVIA test DVD or equivalent.
- A blue filter (provided with many test DVDs), for color level and tint adjustments.

Connect your test pattern source to the input that you are calibrating and proceed as follows. **Perform the adjustments in the order listed here.**

**Brightness:** On your external test pattern source, select a PLUGE pattern. (PLUGE is an acronym for "Picture Line-Up Generation Equipment.") Figure 4-5 shows a typical PLUGE pattern.

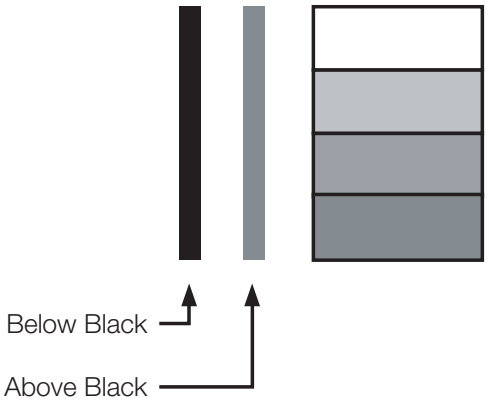



**Figure 4-5. Typical PLUGE Pattern for Adjusting Brightness**

PLUGE patterns vary but generally consist of some combination of black, white and gray areas against a black background. The example above includes two vertical bars and four shaded boxes.

Select Brightness from the Picture Adjust menu. Using the left- and right-arrow ( ◀ ▶ ) buttons, adjust the brightness so that:

- The darkest black bars disappear into the background.
- The dark gray areas are barely visible.
- The lighter gray areas are clearly visible.
- The white areas are a comfortable level of true white.
- The image contains only black, gray and white (no color).

**Contrast:** On your external test pattern source, select a stepped, gray-bar pattern like the one shown in Figure 4-6.

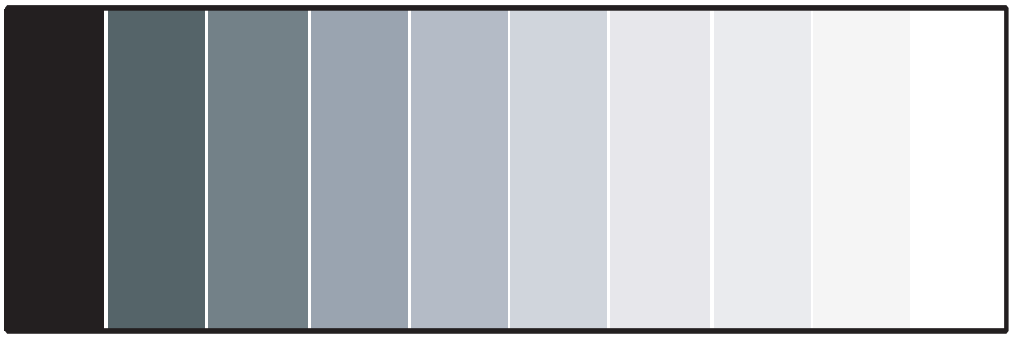


**Figure 4-6. Typical Gray Bar Pattern for Adjusting Contrast**

Select Contrast from the Picture Adjust menu. Using the left- and right-arrow ( ◀ ▶ ) buttons, adjust the contrast to a point just below which the white rectangle starts to increase in size.

***Note***

*Brightness and contrast controls are interactive. A change to one may require a subtle change to the other in order to achieve the optimum setting.*

**Color Saturation:** On your external test pattern source, select a color bar pattern like the one shown in Figure 4-7.

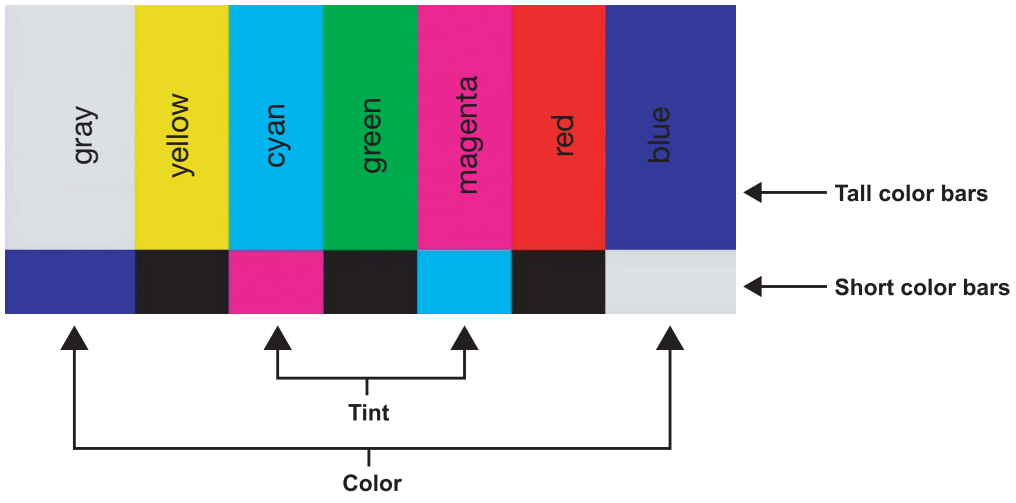
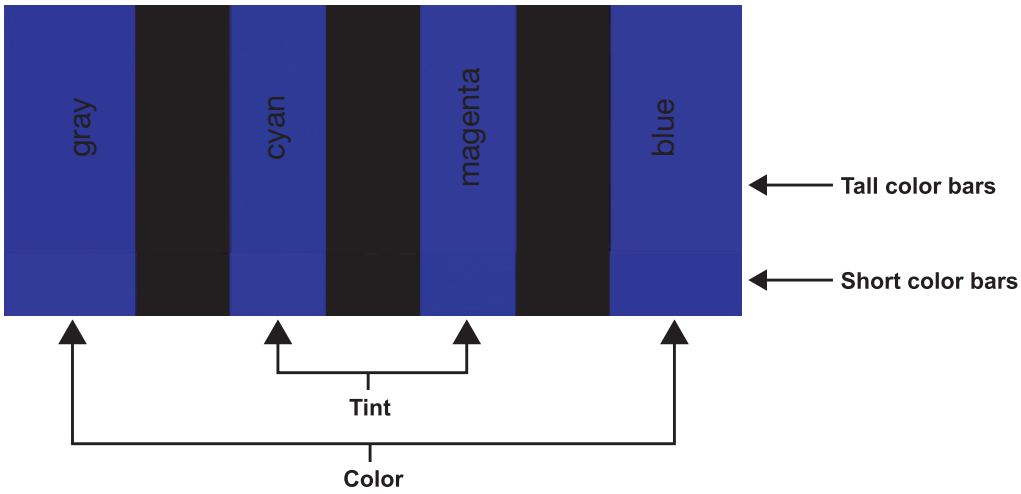



**Figure 4-7. Typical Color Bar Pattern for Adjusting Color Saturation and Tint**

Select Color from the Picture Adjust menu. While looking at the color bar pattern through a blue filter, adjust the color saturation level until the outermost (gray and blue) color bars appear to be a single shade of blue:




**Tint:** Tint or “hue” is essentially the ratio of red to green in the color portion of the image. When tint is decreased, the image appears redder; when it is increased the image appears greener. To set the tint, select Tint from the Picture Adjust menu. While looking at the color bar pattern through a blue filter, adjust the tint level until the cyan and magenta color bars (on either side of the green bar) appear to be a single shade of blue.

***Note***

1. *Like the brightness and contrast controls, the color and tint controls are interactive. A change to one may require a subtle change to the other in order to achieve the optimum setting.*
2. *Color and tint controls are not available on the HDMI or RGB-HD inputs.*

**Sharpness:** “Sharpness” is the amount of high-frequency detail in the image. To adjust sharpness, select Sharpness from the Picture Adjust menu and press **ENTER**. On your external test pattern source, select a pattern like the one shown in Figure 4-8. Adjust as needed, looking for white edges around the transitions from black to gray and different sized lines in the “sweep” patterns at the top and bottom. Lower the sharpness setting to eliminate them.

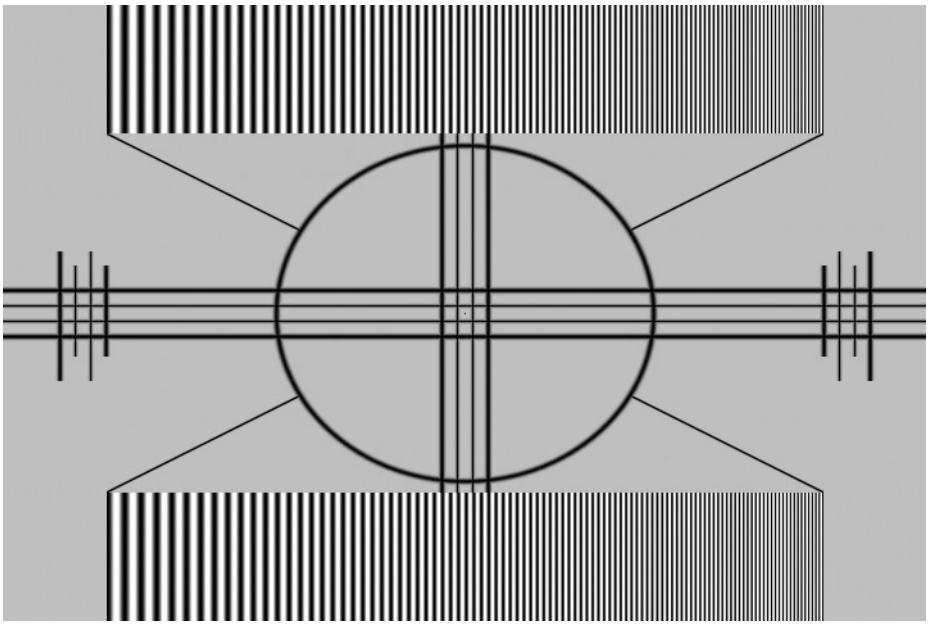


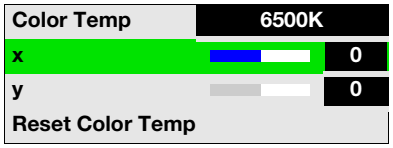
**Figure 4-8. Typical Test Pattern for Adjusting Sharpness**

**Gamma:** The Gamma control determines how gray shades are displayed between minimum input (black) and maximum input (white) for all signals. A good gamma setting helps to optimize blacks and whites while ensuring smooth transitions for the “in-between” values utilized in other grays.

Unlike brightness and contrast controls, Gamma allows you to lighten or darken the overall tone of your images without changing the extremes. All images will be more vibrant while still showing good detail in dark areas.

The default Gamma setting of 2.2 is appropriate for most typical home theater environments.

**Color Temperature:** To adjust the color temperature, select Color Temp from the Picture Adjust menu and press **ENTER**. (Color temperature defines the “color of gray.”) The range is from 5,000K to 10,000K, in increments of 500K. The default setting, 6,500K, is appropriate for most situations. Higher settings produce a “bluer” picture; lower ones impart a reddish hue to the image.




For more precise control over the color temperature, you can adjust the x and y coordinates for gray. These define its location on the standard CIE chromaticity graph, shown in Figure 4-9. (CIE stands for “Commission Internationale de l’Éclairage” (International Commission on Illumination), the organization responsible for color measurement and management standards.) Changing either or both of these numbers changes the hue of gray, within a narrow range above or below the selected color temperature; refer to Table 4-2.

### Table 4-2. Effect of X and Y Coordinates for Color Temperature

| X-adjustment | Y-adjustment | Result |
|---|---|---|
| ▶ | ◀ | red hues |
| ◀ | ◀ | blue hues |
| ◀ | ▶ | green hues |
| ▶ | ▶ | yellow hues |

To restore the default color temperature, select Reset Color Temp and press **ENTER**. Press **ENTER** again to confirm.

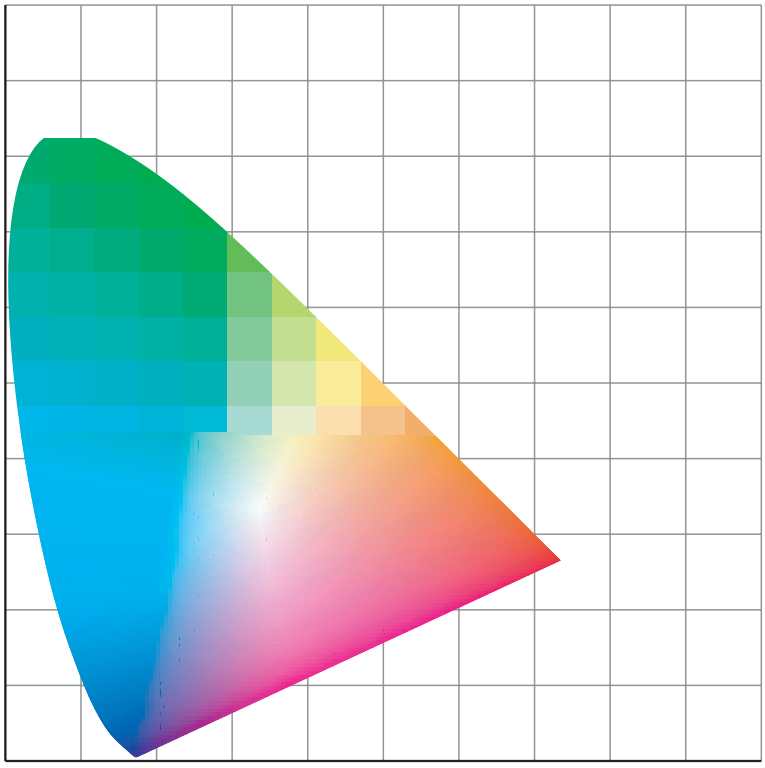
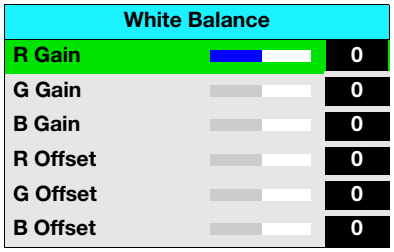


**Figure 4-9. CIE 1931 Chromaticity Diagram**

**ICC Select:** Choose ICC Select from the Picture Adjust menu to specify the color space (Standard, NTSC, HDTV or PAL) that is appropriate for the source signal, to achieve optimal color balance.

If you select NTSC, HDTV or PAL, you can make further adjustments to individual color space characteristics in the ICC Adjust sub-menu under the ISF Settings menu, described later in this section. (The Standard color space is factory-set and not adjustable.)




**White Balance:** To remove any trace of color from the white areas of the projected image, choose White Balance from the Picture Adjust menu and press **ENTER**.

- **Gain:** Use the Gain controls to correct color imbalances in the bright areas of the image. A good way to do this is to use a test pattern consisting mostly of solid white areas, such as an 80 IRE “window” pattern. If the white areas contain traces of red, green or blue, decrease the Gain for that color.
- **Offset:** Use the Offset controls in the White Balance sub-menu to correct color imbalances in the dark areas of the image. A good way to do this is to use a test pattern consisting mostly of dark gray areas, such as a 30 IRE “window” pattern. If the gray areas contain traces of red, green or blue, decrease the Offset for that color.

**Save Settings:** The CL-410/CL-420 lets you save image quality settings for each input and supported resolution to a preset. You can recall this preset at a later time by simply pressing a button on the remote control or using the Restore Picture Settings menu command (see below).

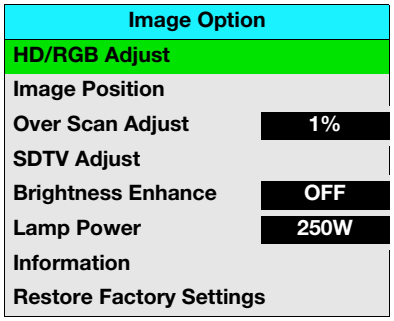
You should save changes to any of the following settings to a preset; otherwise they will be lost when a new input source or resolution is selected:

- Aspect ratio
- Picture adjustments (brightness, contrast, color saturation, tint, sharpness, gamma, color temperature, ICC selection and white balance settings)
- Image options (SDTV adjust settings, brightness enhance, lamp power)

**Restore Picture Settings:** To recall a preset, choose Restore Picture Settings from the Picture Adjust menu and select “Custom1,” “ISF Day” or “ISF Night.” Or, use the corresponding buttons on the remote control.

### *Image Option* ➤

Use the controls in the Image Option menu to perform advanced image quality adjustments, obtain information about the projector or perform a factory reset.




**HD/RGB Adjust:** To improve the quality of projected images from a computer or other analog RGB source, select HD/RGB Adjust and press **ENTER**.

- **Clock:** If you notice flickering or vertical noise when displaying computer images, adjust the Clock setting to correct the issue.
- **Phase:** Adjust the phase if the image shows shimmer or “horizontal” noise. Pixel phase adjusts the phase of the pixel sampling clock relative to the incoming signal. The effect of this control is similar to that of a tracking control on a VCR.

  For best results, use a good test pattern such as a smooth gray consisting of a clear pattern of black and white pixels, or a similar “half on, half off” graphic image. (You may notice that you can stabilize the image at more than one point. Use either setting in this case.)

  To restore the original Clock and Phase settings, select Reset and press **ENTER**, then press **ENTER** again to confirm the reset.

- **Auto Tune:** Auto Tune automatically adjusts settings to optimize computer images. Auto Tune can be executed either on command or automatically whenever an incoming RGB signal is present. To execute Auto Tune on command, select Execute Auto Tune and press **ENTER**. To enable automatic Auto Tune, select Auto Tune and set it to ON.

*Auto Tune may take some time to complete, depending on the characteristics of the incoming signal.*

**Image Position:** To adjust the horizontal and vertical position of the projected image, select Image Position from the Image Option menu and press **ENTER**.

- **H Position:** Use the up- or down-arrow buttons ( ▲, ▼ ) to select H Position. Then, use the right-arrow button ( ▶ ) to shift the image to the right; use the left-arrow button ( ◀ ) to shift the image to the left.
- **V Position:** Use the up- or down-arrow buttons ( ▲, ▼ ) to select V Position. Then, use the right-arrow button ( ▶ ) to shift the image up; use the left-arrow button ( ◀ ) to shift the image down.

To restore the default image position, select Reset and press **ENTER**. Then, press **ENTER** to confirm or **EXIT** to cancel.

**Over Scan Adjust:** Overscan pushes the outside edge of the active picture area of the video signal out beyond the edge of the display area.

Some television programs are produced based on the assumption that older television sets may not display the outer edges of the broadcast picture area. Over scan effectively trims away these inactive, outer edges and enlarges the remaining portion of the image to fill the display area.

Select from 0% to 10% of Overscan, as desired.

For HDTV, DVDs and other video sources, Overscan is generally not necessary or desirable.

**SDTV Adjust:** To maximize the quality of 480i (composite, S-Video or component) video signals, select SDTV Adjust from the Image Option menu and press **ENTER**.

- **Chroma Enhance:** Use Chroma Enhance to add chroma (color information) to the input signal, making colors appear more vibrant and saturated.
- **Video On Film:** Set Video On Film to ON to repair distortions or abnormalities in a video image.
- **Film Mode:** Use the Film Mode control to smooth out moving images from interlaced sources. In most cases, the CL-410/CL-420 detects the proper “pull-down” rate and vertical frequency. However, if your source is jittery and/or tearing you may wish to force a setting to ensure stable processing for that source.

**Brightness Enhance:** to amplify the bright areas of the image, select Brightness Enhance and use the right- or left-arrow button ( ◀ or ▶ ) to set it to ON. Brightness Enhance can be useful for high ambient light environments or when you use the lower Lamp Power setting (see below).

**Lamp Power:** Select Lamp Power from the Display Color Menu to adjust the lamp output level. You can choose to run the lamp as bright as possible (250W; this is the default setting) or you can choose the lower setting (200W). Generally, lower lamp output can prolong the life of the lamp, but decreases brightness.

| Source : | Component 1 |
|---|---|
| Resolution: | 720 x 480 |
| Vert Freq : | 60 Hz |
| Horz Freq : | 31 kHz |
| Lamp Timer : | 720 HR |
| F/W Version : | 211 . 3 . 06 |

**Information:** Select Information from the Main Menu to see information about the current source, input resolution, horizontal and vertical frequencies, lamp hours and the installed firmware version.

Should you ever need to contact Runco Technical Support, this information will help them answer your questions or resolve product performance issues.

**Restore Factory Settings:** To reset all items in the Image Options menu to their factory default values, select Restore Factory Settings and press **ENTER**. A warning message appears; press **ENTER** again to confirm the reset or press **EXIT** to cancel. After the reset, the projector powers off and restarts.

### *Installation* ➤

The Installation menu to change the picture orientation, appearance and behavior of the OSD menus, fan speed and other projector settings.

| Installation | |
|---|---|
| Language | English |
| Picture Configuration | Floor Front |
| OSD Timeout | 5 secs |
| OSD Transparent | OFF |
| Source Detect | Auto |
| Auto Power Off | OFF |
| Blue Enable | OFF |
| OSD Position | |
| Keystone | |
| Fan High Speed Mode | ON |

**Language:** Select Language from the Installation menu and press the right- or left-arrow buttons to select the OSD language (English, French, Italian, German or Spanish).

**Picture Configuration:** Select Picture Configuration from the Installation menu to change the picture orientation to suit the method of installation (Floor Front, Floor Rear, Ceiling Front or Ceiling Rear).

**OSD Timeout:** The OSD Timeout setting controls how long the OSD menus stay on screen when no buttons are pressed. Select a time-out period of 5, 15 or 60 seconds.

**OSD Transparent:** To allow the projected image to show through the OSD menus, select OSD Transparent from the Installation menu and set it to ON.

**Source Detect:** The CL-410/CL-420 can automatically detect an incoming signal and switch to that input. To enable automatic source detection, select Source Detect from the Installation menu and set it to Auto.

**Auto Power Off:** The CL-410/CL-420 can be set to power off automatically after 15 minutes of no input signal or user input via the remote control. To enable this feature, set it to ON. When you do, a warning message appears on-screen five minutes before the shutdown is to occur. To prevent the projector from powering off, press any key on the remote control.

**Blue Enable:** Blue Enable removes all red and green color information from the image, simulating a blue filter. You can use it instead of a blue filter when performing color and tint adjustments.

**OSD Position:** To change the position of the OSD controls, select OSD Position from the Installation menu. Use the up- and down-arrow buttons to select Top Left, Bottom Left, Top Right or Bottom Right, then press **ENTER**.

**Keystone Correction:** If the projector and screen are not installed perpendicular to each other, the image may become distorted in a trapezoidal shape, as shown in Figure 4-10. Select Keystone from the Installation menu to compensate for this.

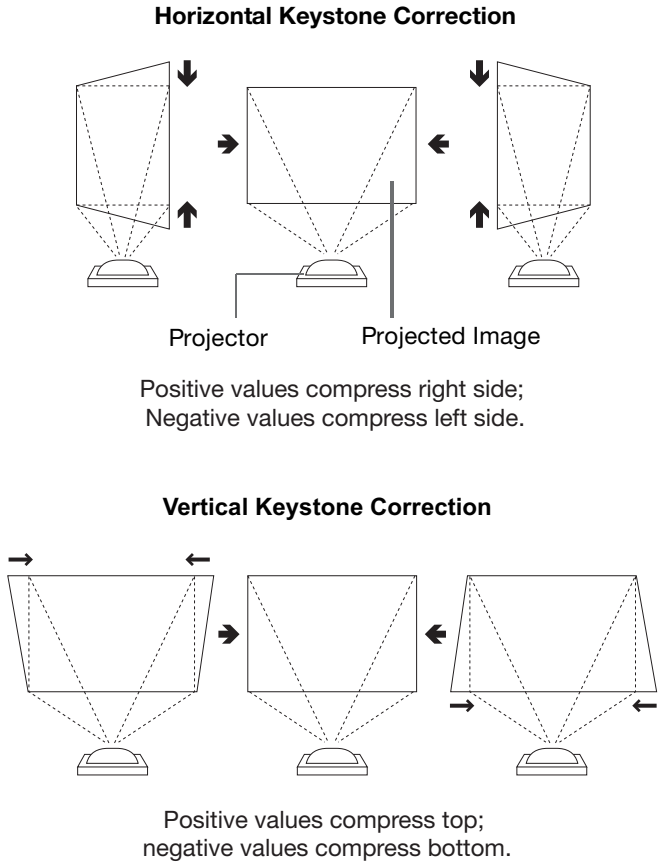


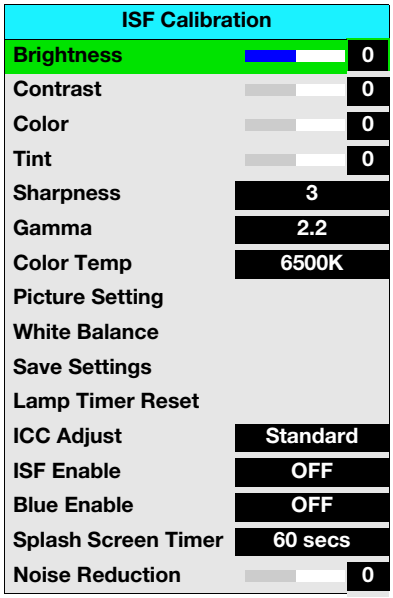

**Figure 4-10. Horizonal and Vertical Keystone Correction**

***Note***

1. *The CL-410/CL-420 keystone correction can compensate for up to approximately 15 degrees of screen and/or projector tilt.*
2. *Straight lines or the edges of images may appear jagged while adjusting the image.*
3. *Keystone correction is not possible with a 1080i input signal.*

**Fan High Speed Mode:** If the projector is being used in a high-altitude environment, use Fan High Speed Mode to prevent it from overheating. Set Fan High Speed Mode to ON to run the fan at high speed; set it to OFF to run the fan at normal speed.

### *ISF Settings* ➤




Use the ISF Settings menu to perform advanced picture quality adjustments. **This menu should be used by ISF-certified technicians only.**

***Note*** *You must enter a passcode to access the ISF Settings menu.*

Several controls in this menu are identical to those in the Picture Adjust menu, but are accessible only by entering the ISF Calibration menu passcode. This makes it possible to restore the picture quality settings to what they were when the projector was installed, simply by recalling the “ISF Night” or “ISF Day” preset.

**Brightness:** Refer to ***Brightness*** on page 35.

**Contrast:** Refer to ***Contrast*** on page 36.

**Color:** Refer to ***Color Saturation*** on page 36.

**Tint:** Refer to ***Tint*** on page 37.

**Sharpness:** Refer to ***Sharpness*** on page 38.

**Gamma:** Refer to ***Gamma*** on page 38.

**Color Temp:** Refer to ***Color Temperature*** on page 39.

**Picture Setting:** To recall the Custom1, ISF Night or ISF Day settings, choose Picture Setting from the ISF Calibration menu. Then, select “Custom1,” “ISF Night” or “ISF Day” and press **ENTER**, or use the corresponding buttons on the remote control.

**White Balance:** Refer to ***White Balance*** on page 40.

**Save Settings:** For each input and supported resolution, the CL-410/CL-420 lets you save image quality settings as presets that you can recall at a later time. You can create up to three presets -- designated “Custom1,” “ISF Day” and “ISF Night” -- per input and resolution.

You should save changes to any of the following settings to a preset; otherwise they will be lost when a new input source or resolution is selected:

- Aspect ratio
- Picture adjustments (brightness, contrast, color saturation, tint, sharpness, gamma, color temperature, ICC selection and white balance settings)
- Image options (SDTV adjust settings, brightness enhance, lamp power)

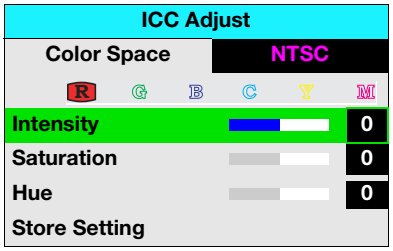
To save image settings in the “ISF Day” or “ISF Night” preset, select Save Settings from the ISF Calibration menu and select “ISF Day” or “ISF Night.” (To save settings to the “Custom1” memory preset, refer to ***Save Settings*** on page 40.)

**Lamp Timer Reset:** When you replace the projector lamp, you should also reset the lamp hour counter. To do this, select Lamp Timer Reset from the ISF Calibration menu and press **ENTER**. The CL-410/CL-420 shows the number of hours the projector lamp has been in service and asks you to confirm or cancel the reset. Press **ENTER** to confirm or **EXIT** to cancel.

For detailed lamp replacement instructions, refer to ***Lamp Replacement*** on page 50.

**ICC Adjust:** Use the ICC Adjust controls to customize the stored NTSC, HDTV and/or PAL color space characteristics. To do this:

1. Select ICC Adjust from the ISF Calibration menu and press **ENTER**.
2. Select the color space to modify using the left- or right-arrow buttons.
3. Select a component color (Red, Green, Blue, Cyan, Yellow or Magenta).




For each component color, you can adjust the following:

- **Intensity:** This slidebar adjusts the intensity -- also known as *luminance* -- of a given color.
- **Saturation:** This slidebar adjusts the color saturation level -- the *amount* of that color in a video image. Lower settings produce less saturated colors; a setting of "-64" removes that color from the image entirely. If the saturation is too high, that color will be overpowering and unrealistic.
- **Hue:** This slidebar adjusts the red/green color hue for true color reproduction of video signals. For best results, adjust the hue while displaying an external color bar test pattern (Figure 4-7).

When you have finished customizing the color space, select Store Setting and press **ENTER**.

**ISF Enable:** Use ISF Enable to control the display of the ISF logo on the CL-410/CL-420 splash screen upon power-up; see Figure 4-11.

**Figure 4-11. ISF-Enabled CL-410/CL-420 Splash Screen**

**Blue Enable:** Refer to ***Blue Enable*** on page 42.

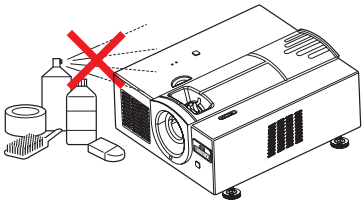
**Splash Screen Timer:** Press the right- or left-arrow buttons to set the Splash Screen Timer. This timer controls how long the startup (ISF and Runco logo) image stays on-screen after you turn on the projector. Select from 15 to 60 seconds, in 5-second increments.

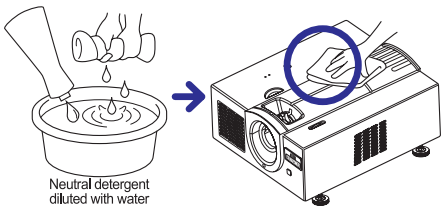
**Noise Reduction:** To apply Digital Noise Reduction (DNR) to the input signal, select Noise Reduction from the ISF Calibration menu. Noise reduction is useful for clearing up noisy RGB images such as those from a PC. Adjust as desired using the left- or right-arrow buttons, keeping in mind that reducing noise (which reduces high frequencies) may also “soften” the image.

# 5. Maintenance and Troubleshooting

## 5.1 Cleaning the Projector

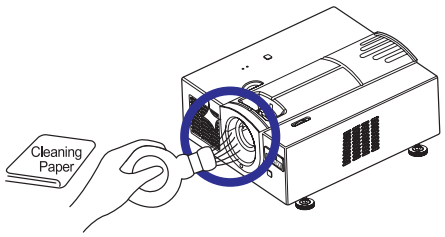
- Unplug the power cord before cleaning the projector.
- Avoid using benzene or thinner, as these can damage the finish on the projector exterior.
- Do not use volatile agents, such as insecticides, on the projector.
- Do not leave rubber or plastic objects in contact with the projector for long periods as they may damage the finish of the projector.
- Wipe off dirt gently with a soft flannel cloth.
- For hard-to-remove dirt, soak a cloth in a neutral detergent diluted with water, wring the cloth well and then wipe the projector.
- Strong cleaning detergents may discolor, warp or damage the coating on the projector. Make sure to test on a small, inconspicuous area on the projector before using.






## 5.2 Cleaning the Lens

- Use a commercially available blower or lens cleaning paper (for glasses and camera lenses) for cleaning the lens. Do not use any liquid cleaning agents, as they may wear the coating film on the surface of the lens.
- The surface of the lens is easily damaged. Do not scrape or hit the lens.

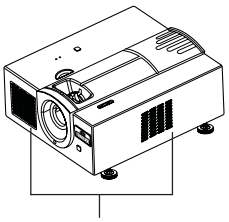


## 5.3 Cleaning the Intake and Exhaust Vents

This CL-410/CL-420 is equipped with intake and exhaust vents to allow the flow of cool air through the projector and maintain the proper operating temperature.

You should periodically clean the vents by vacuuming them with a vacuum cleaner. Runco recommends doing this after every 100 hours of use, or more often if the projector is used in a dirty or smoky location.

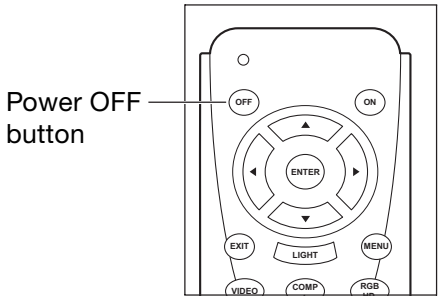
**Side and front view**



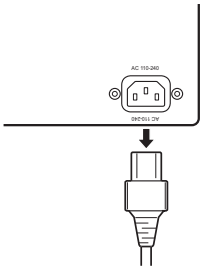
Ventilation holes

To clean the intake and exhaust vents:

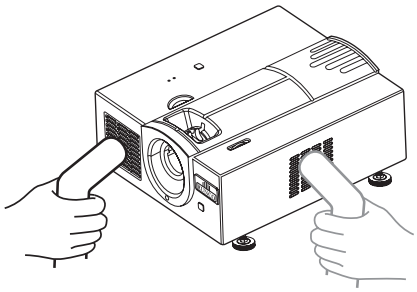
1. Press **OFF** on the remote control to turn off the power. Wait until the cooling fan stops.




2. Unplug the power cord.



3. Remove dust by placing the cleaner hose on the intake and exhaust vents.



## 5.4 Lamp Maintenance

The projector lamp has a life of 2,000 hours. Maintain proper ventilation to keep the lamp operating throughout its lifetime. Do not subject the projector to unnecessary vibration.

- Lamp replacement is recommended after approximately 2,000 cumulative hours of use or when you notice a significant deterioration in the picture and color quality. To find out how long the currently-installed lamp has been in service, select Information from the Image Options menu.
- The actual lamp service life may be less than 2,000 hours depending on the environment in which the projector is used.
- **For lamp replacement, please contact your nearest Runco authorized service center or Runco dealer. Do not attempt to replace the lamp yourself!**

## 5.5 Lamp Cautions

***Caution***

*This projector uses a pressurized mercury lamp. A loud sound may indicate lamp failure. Lamp failure is caused by excessive shock, improper cooling, surface scratches or deterioration of the lamp due to usage. The period of time up to failure largely varies depending on the individual lamp and the condition and the frequency of use. It is important to note that failure can often result in the bulb cracking.*

*When the lamp replacement indicator and on-screen display icon are illuminated or are flashing, replace the lamp with a new one immediately, even if the lamp appears to be operating normally.*

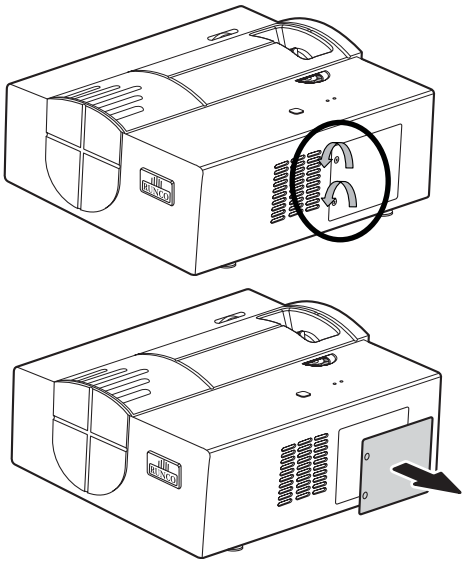
*If the lamp breaks, glass particles may spread inside the lamp cage or gas contained in the lamp may be vented into the room from the exhaust vent. As the gas in this lamp contains mercury, ventilate the room well if the lamp breaks and avoid all exposure to the released gas. In case of exposure to the gas, consult a doctor as soon as possible.*

*If the lamp breaks, there is also a possibility that glass particles may spread inside the projector. If this happens, contact your nearest Authorized Dealer to remove the damaged lamp and ensure safe operation.*

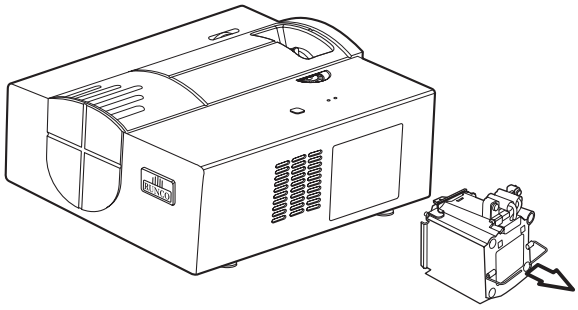
*Do not remove the lamp unit immediately after turning off the projector. Touching a hot lamp can cause burns or injury. Wait at least one hour after the disconnecting the power cord to allow the surface of the lamp unit to fully cool before removing.*

## 5.6 Lamp Replacement

1. Turn off the projector and wait for the cooling fan to stop.
2. Unplug the power cord. Allow the projector to cool down for approximately one hour prior to removing the lamp assembly for replacement.
3. Loosen the two captive lamp cover screws and remove the cover.



4. Loosen the four lamp assembly mounting screws.
5. Grasp the lamp assembly handle and pull gently, removing the lamp module from the projector housing. As you do so, the lamp cooling interlock switch on the inside of the lamp mounting frame (near the top) moves to the OF position.



6. Gently slide the new lamp assembly into the mounting frame. Align the two power connectors at the top of the lamp assembly with the two sockets at the top of the mounting frame. Press gently on both sides of the lamp assembly to snap it into place. As you do so, the lamp cooling interlock switch returns to the ON position.
7. Tighten the lamp assembly mounting screws.
8. Replace the lamp cover and secure the captive lamp cover screws.
9. Plug in the projector and turn it on.
10. Reset the Lamp Timer to zero. To do this, select Lamp Timer Reset from the ISF Calibration menu and press **ENTER**. The CL-410/CL-420 shows the number of hours the projector lamp has been in service and asks you to confirm or cancel the reset. Press **ENTER** again to confirm.

## 5.7 Troubleshooting Tips

Table 5-1 provides some general guidelines for troubleshooting problems you may encounter with the CL-410/CL-420. If you encounter an issue not described here, please contact your Runco dealer or Runco Technical Support.

### Table 5-1. Troubleshooting Chart

| Symptom | Possible Cause(s) | Solution |
|---|---|---|
| The projector does not turn on after initial installation. | • The CL-410/CL-420 is not plugged in or the AC outlet is not active.<br>• The remote control batteries have run out. | • Ensure that the CL-410/CL-420 is plugged in and that the AC outlet is active.<br>• Replace the batteries. |
| The projector is on, but there is no video image on-screen. | • Incorrect source selection.<br>• Source component is not turned on. | • Select the correct source.<br>• Turn on the source component. |
| A projected image from a DVD is split or otherwise scrambled. | • DVD player is set to progressive scan mode. | • Turn off progressive scan on the DVD player.<br>• Connect the DVD player to the HD/RGB 1 or HD/RGB 2 input. |
| Image is too bright and/or lacks definition in the bright areas of the image. | • Contrast is set too high. | • Lower the contrast setting. |
| Image appears “washed out” and/or dark areas appear too bright. | • Brightness is set too high. | • Lower the brightness setting. |
| Colors in the image are swapped; for example, reds appear blue or vice versa. | • The Red/Pr, Green/Y or Blue/Pb outputs from the source are connected to the wrong inputs on the CL-410/CL-420. | • Ensure that the source outputs are connected to the correct CL-410/CL-420 input. |
| RGB-HD images appear “noisy.” | • Clock and Phase settings need adjustment. | • Manually adjust Clock and Phase settings, or perform an Auto-Tune (refer to ***HD/RGB Adjust*** on page 40). |
| The projector will not turn back on after it was powered down, or the image disappears during operation. | • The projector will not turn on for two minutes after power-down, to protect the lamp.<br>• The lamp has failed or was improperly installed. | • Wait until the cooling fan stops.<br>• Replace or re-install the lamp. |

## Notes:

# 6. Serial Communications

## 6.1 RS-232 Connection and Port Configuration

To interface the CL-410/CL-420 with a home theater automation/control system or a PC running terminal emulation software, connect it to your control system or PC as shown in Figure 3-11.

Configure the RS-232 controller or PC serial port as follows: no parity, 8 data bits, 1 stop bit and no flow control. Set the baud rate to 9600, to match that of the CL-410/CL-420 RS-232 port.

## 6.2 Serial Command Syntax

Table 6-1 lists the RS-232 command set. All commands are in ASCII format and must be in UPPERCASE.

When you send a valid command, the CL-410/CL-420 executes it and acknowledges it with the first three characters of the command followed by "OK;" for example, "RRA0K." When you send an invalid command, the CL-410/CL-420 ignores it and returns the first three characters of the command followed by "NG;" for example, "RRXNG."

**Table 6-1. Serial Commands**

| Command | Description | Reply |
|---|---|---|
| RRA00 | Saves current settings to the CUSTOM 1 memory (Note 1) | RRAOK |
| RRA01 | Saves current settings to the ISF Day memory (Note 1) | RRAOK |
| RRA02 | Saves current settings to the ISF Night memory (Note 1) | RRAOK |
| RRB00 | Recalls the Custom 1 memory settings | RRBOK |
| RRB01 | Recalls the ISF Day memory settings | RRBOK |
| RRB02 | Recalls the ISF Night settings | RRBOK |
| RRC00 | Selects the S-VIDEO input | RRCOK |
| RRC01 | Selects the COMPOSITE VIDEO input | RRCOK |
| RRC02 | Selects the COMPONENT 1 input | RRCOK |
| RRC03 | Selects the COMPONENT 2 input | RRCOK |
| RRC04 | Selects the HDMI input | RRCOK |
| RRC05 | Selects the RGB input | RRCOK |

*Notes:*

1. *All image quality settings must be made with the remote control. After the image adjustments are complete, you can use these commands to store the settings in the selected memory.*
2. *The power on command (PON) will not provide an OK reply; it will instead reply with a random character. For your automation system, simply ensure that you receive a character after the PON command. If you do not get any reply after PON, send PON again.*

**Table 6-1. Serial Commands (continued)**

| Command | Description | Reply |
|---|---|---|
| RRD00 | Selects the ANAMORPHIC (16:9) aspect ratio | RRDOK |
| RRD01 | Selects the STANDARD (4:3) aspect ratio | RRDOK |
| RRD02 | Selects the LETTERBOX aspect ratio | RRDOK |
| RRD03 | Selects the VIRTUALWIDE aspect ratio | RRDOK |
| RRD04 | Selects the CINEMA (2.35:1) aspect ratio | RRDOK |
| RRD05 | Selects the VIRTUAL CINEMA aspect ratio | RRDOK |
| RRE00 | Turns the projector OFF | RREOK |
| PON | Turns the projector ON | Random (Note 2) |

*Notes:*

1. *All image quality settings must be made with the remote control. After the image adjustments are complete, you can use these commands to store the settings in the selected memory.*
2. *The power on command (PON) will not provide an OK reply; it will instead reply with a random character. For your automation system, simply ensure that you receive a character after the PON command. If you do not get any reply after PON, send PON again.*

# 7. Specifications

## 7.1 CL-410/CL-420 Specifications

Table 7-1 lists the CL-410/CL-420 specifications.

### Table 7-1. CL-410/CL-420 Specifications

| | |
|---|---|
| **Projector Type:** | Digital Light Processing (DLP), single-chip SuperOnyx™ DMD |
| **Native Resolution:** | **CL-410:** 1024 x 576 (16:9)<br>**CL-420:** 1280 x 720 (16:9) |
| **Aspect Ratios:** | 4:3, Letterbox, 16:9 Anamorphic, VirtualWide, Cinema, Virtual Cinema |
| **Video Standards:** | NTSC, PAL, SECAM |
| **Scan Frequency:** | Horizontal: 15 - 80 kHz<br>Vertical: 43 - 100 Hz |
| **Picture Size (16:9 Screen):** | Recommended Width: 72 to 120 in.<br>Maximum Width: 150 in. |
| **Throw Distance (Factor x Screen Width):** | **CL-410**<br>Minimum: Screen Width x 1.37<br>Maximum: Screen Width x 1.67<br>**CL-420**<br>Minimum: Screen Width x 1.40<br>Maximum: Screen Width x 1.70 |
| **Horizontal Offset:** | 8% of screen width left or right |
| **Vertical Offset – CL-410:** | Ceiling-mounted --<br>60% of screen height below;<br>40% of screen height above<br>Floor-mounted --<br>40% of screen height below;<br>60% of screen height above |
| **Vertical Offset – CL-420:** | Ceiling-mounted --<br>63% of screen height below;<br>46% of screen height above<br>Floor-mounted --<br>46% of screen height below;<br>63% of screen height above |
| **Lamp:** | 250 Watts |
| **Estimated Lamp Life:** | 2000 hours |
| **Source Inputs:** | (1) Composite; (1) S-Video; (2) RCA Component (YPbPr); (1) VGA; (1) HDMI 1.2 with HDCP |
| **Control Options:** | - Discrete infrared remote<br>- Serial commands via RS-232 |
| **RS-232 Communication Parameters:** | 9600 bps, no parity, 8 data bits, 1 stop bit, no flow control |

## Table 7-1. CL-410/CL-420 Specifications (continued)

| | |
|---|---|
| **+12V Output:** | 0.25 Amps, active when the projector is turned on |
| **Power Requirements:** | 100 to 240 VAC (auto-sensing), 50/60 Hz, 370 Watts |
| **Operating Environment:** | 41°F to 95°F (5°C to 35°C), 0% to 90% humidity (non-condensing) |
| **Dimensions:** | See Figure 7-1 |
| **Weight (including lens):** | 25 lbs. (11.34 kg) |
| **Brightness and Contrast:** | **Cinema Standards Measurement System (CSMS) Specifications**<br>- Brightness: 16.0 foot-Lamberts (fL) (CL-410); 16.3 fL (CL-420)<br>- Contrast Ratio: 221:1 (CL-410); 228:1 (CL-420)<br>These measurements are taken from the projector in a controlled, home theater environment. All measurements are made to ANSI/NAPM IT7.228-1997 specifications using the Photo Research PR-650 SpectraColorimeter and Minolta LS-100 Luminance Meter, Video Essentials test DVD and a 1.3 gain, 72-inch wide screen. The projector is calibrated to a color temperature of 6,500K and has a minimum of 150 hours of usage. The foot-Lambert (fL) is the unit of measurement used in commercial movie theaters to express image brightness at the screen surface. The Society of Motion Picture and Television Engineers (SMPTE) specifies 16 fL as the target image brightness for film-based projectors using an open gate (without film in the projector). More importantly, today SMPTE specifies 12 fL as the target image brightness in Digital Cinema theaters. The foot-Lambert measurement is dependent on screen size, screen gain and projector light output.<br>**Home Theater Calibration Specifications**<br>- Light Output: 412 ANSI Lumens (CL-410); 421 ANSI Lumens (CL-420)<br>- Contrast Ratio: 221:1 (CL-410); 228:1 (CL-420)<br>These specifications are obtained by calibrating the projector as described above for CSMS measurements.<br>**Industry-Standard Specifications**<br>- Light Output: 800 ANSI Lumens (CL-410); 850 ANSI Lumens (CL-420)<br>- Contrast Ratio: 2500:1 (CL-410); 2600:1 (CL-420)<br>These are typical projector brightness and contrast specifications found in most companies' sales literature. Runco includes these measurements in its literature to allow for direct comparison with other manufacturers' projectors. These measurements are typically taken at 9,000K to 13,000K to get expected performance data when the projector is used in professional, commercial and industrial displays. |
| **Regulatory Approvals:** | Complies with FCC, CE C-Tick |
| **Limited Warranty:** | Projector: Two (2) years parts and labor from the date of delivery to the end user.<br>Lamp: 1000 hours or six (6) months, whichever comes first. |

**Specifications are subject to change without notice.**

## 7.2 CL-410/CL-420 Dimensions

Figure 7-1 shows the CL-410/CL-420 dimensions.

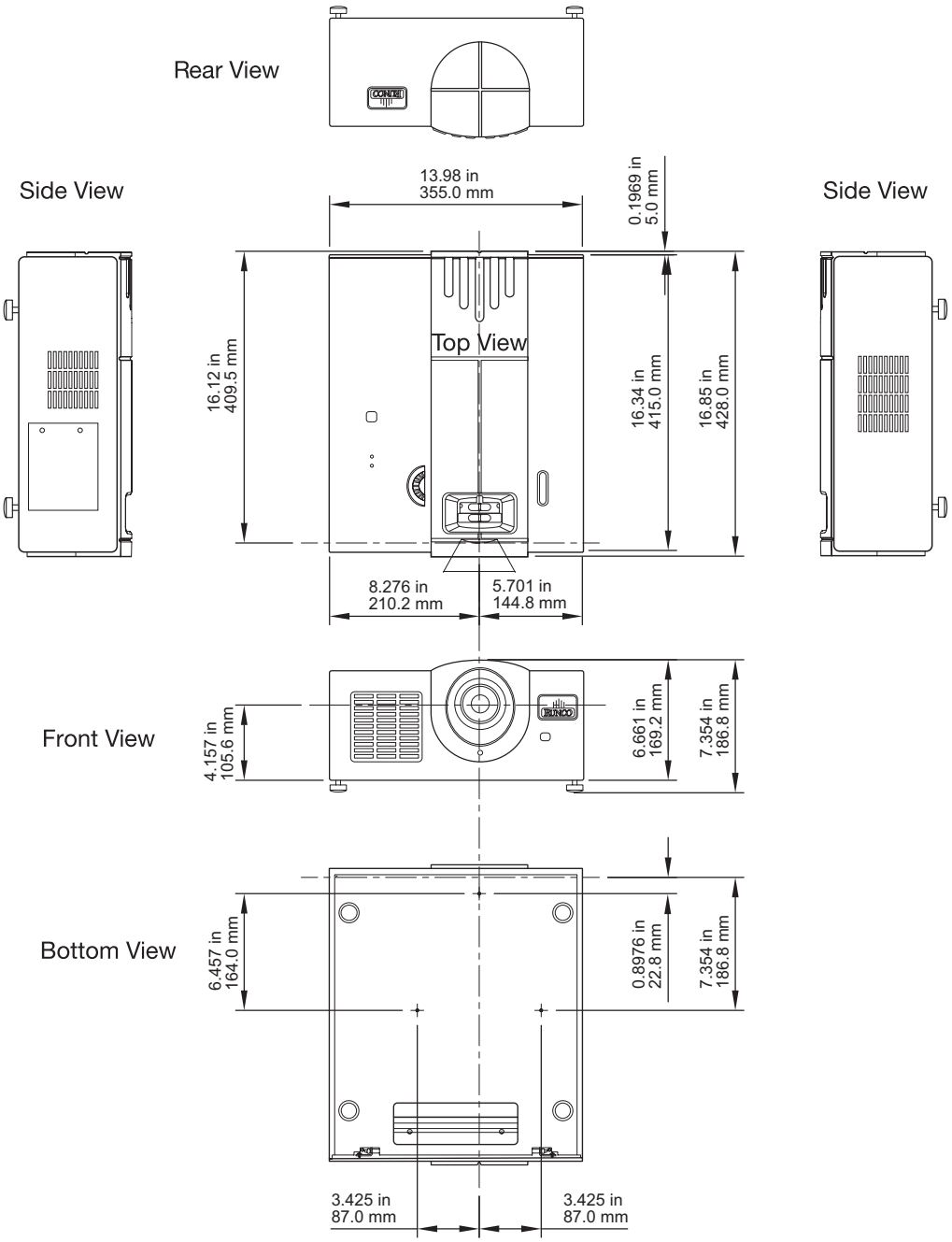



**Figure 7-1. CL-410/CL-420 Dimensions**

## 7.3 Computer Signal Compatibility

The CL-410/CL-420 can display video signals from a variety of computer sources via its RGB-HD and HDMI inputs. It is compatible with the three most common sync modes – sync-on-green, composite sync and RGB with separate sync – as well as XGA display adapters that use advanced intelligent compression.

Table 7-2 lists the signal types that are compatible with the CL-410/CL-420, and indicates which of those are VESA standards.

### Table 7-2. Computer Signal Compatibility Chart

| PC/MAC/ WS | Resolution | | Horizontal Frequency (kHz) | Vertical Frequency (Hz) | VESA Standard | HDMI Support | Display |
|---|---|---|---|---|---|---|---|
| PC | VGA | 640 x 350 | 27.0 | 60 | | | Upscale |
| | | | 31.5 | 70 | | | |
| | | | 37.9 | 85 | √ | | |
| | | 720 x 350 | 27.0 | 60 | | | |
| | | | 31.5 | 70 | | | |
| | | 640 x 400 | 27.0 | 60 | | √ | |
| | | | 31.5 | 70 | | √ | |
| | | | 37.9 | 85 | √ | √ | |
| | | 720 x 400 | 27.0 | 60 | | √ | |
| | | | 31.5 | 70 | | √ | |
| | | | 37.9 | 85 | √ | √ | |
| | | 640 x 480 | 26.2 | 50 | | √ | |
| | | | 31.5 | 60 | | √ | |
| | | | 36.8 | 70 | | √ | |
| | | | 37.9 | 72 | √ | √ | |
| | | | 37.5 | 75 | √ | √ | |
| | | | 43.3 | 85 | √ | √ | |
| | | | 47.9 | 90 | | √ | |
| | | | 53.0 | 100 | | √ | |
| PC | SVGA | 800 x 600 | 31.4 | 50 | | √ | Upscale |
| | | | 35.1 | 56 | √ | √ | |
| | | | 37.9 | 60 | √ | √ | |
| | | | 44.5 | 70 | | √ | |
| | | | 48.1 | 72 | √ | √ | |
| | | | 46.9 | 75 | √ | √ | |

*Notes:*

1. *This projector may not be able to display images from notebook computers in simultaneous (CRT/LCD) mode. Should this occur, switch the notebook computer to "CRT only" mode. If you are unsure how to do this, refer to your notebook computer's user manual.*
2. *When this projector receives 640 × 350 VESA format VGA signals, "640 × 400" appears on the screen.*
3. *Interlaced video signals received through the RGB input may not display correctly. If this occurs, use the Component 1, Component 2, S-video or Composite video input instead.*

## Table 7-2. Computer Signal Compatibility Chart (continued)

| PC/MAC/ WS | Resolution | | Horizontal Frequency (kHz) | Vertical Frequency (Hz) | VESA Standard | HDMI Support | Display |
|---|---|---|---|---|---|---|---|
| PC | SVGA | 800 x 600 | 53.7 | 85 | √ | √ | Upscale |
| | | | 56.8 | 90 | | √ | |
| | | | 64.0 | 100 | | √ | |
| PC | XGA | 1024 x 768 | 35.5 | 43 | | √ | True |
| | | | 40.3 | 50 | | √ | |
| | | | 48.4 | 60 | √ | √ | |
| | | | 56.5 | 70 | √ | √ | |
| | | | 60.0 | 75 | √ | √ | |
| | | | 68.7 | 85 | √ | √ | |
| | | | 73.5 | 90 | | √ | |
| | | | 77.2 | 96 | | | |
| | | | 80.6 | 100 | | | |
| MAC 13” | VGA | 640 x 480 | 34.9 | 67 | | | Upscale |
| MAC 16” | SVGA | 832 x 624 | 49.6 | 75 | | | |
| MAC 19” | XGA | 1024 x 768 | 48.4 | 60 | √ | | True |

*Notes:*

1. *This projector may not be able to display images from notebook computers in simultaneous (CRT/LCD) mode. Should this occur, switch the notebook computer to “CRT only” mode. If you are unsure how to do this, refer to your notebook computer’s user manual.*
2. *When this projector receives 640 × 350 VESA format VGA signals, “640 × 400” appears on the screen.*
3. *Interlaced video signals received through the RGB input may not display correctly. If this occurs, use the Component 1, Component 2, S-video or Composite video input instead.*

## 7.4 Video Signal Compatibility

Table 7-3 lists numerous common video signal formats and indicates which input(s) on the CL-410/CL-420 can accept a given format.

### Table 7-3. Video Signal Compatibility Chart

| Resolution | | | H-Freq (kHz) | V-Freq (Hz) | Compatible Inputs (Note 1) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Comp. 1 | Comp. 2 | S-Video | Com-posite | VGA | HDMI |
| SD Video | NTSC | 640 x 480i | 15.73 | 59.94/60 | √ | √ | √ | √ | | |
| | PAL | 768 x 576i | 15.63 | 50 | √ | √ | √ | √ | | |
| | SECAM | | | | √ | √ | √ | √ | | |
| | NTSC-4.43 | | | | (adjustment required) | | | | | |
| | PAL-M | | | | | | | | | |
| | PAL-N | | | | | | | | | |
| | NTSC-J | | | | | | | | | |
| | PAL-60 | | | | | | | | | |
| | NTSC-50 | (not supported) | | | | | | | | |
| EDTV | 480p | 720 x 480p | 31.5 | 59.94/60 | √ | √ | | | √ | √ |
| | 576p | 720 x 576p | 31.3 | 50 | √ | √ | | | √ | √ |
| HDTV | 1080i/50 | 1920 x 1080i | 28.1 | 50 | √ | √ | | | √ | √ |
| | 1080i/60 | | 33.8 | 59.94/60 | √ | √ | | | √ | √ |
| | 720p/50 | 1280 x 720p | 37.5 | 50 | √ | √ | | | √ | √ |
| | 720p/60 | | 45.0 | 59.94/60 | √ | √ | | | √ | √ |
| HTPC (Note 2) | 720p/48 | 1280 x 720p | | 48 | | | | | √ | |
| | 720p/75 | | | 75 | | | | | √ | |
| | 576p/48 | 1024 x 576p | | 48 | | | | | √ | |

*Notes:*

*1. The Component 1 and Component 2 inputs accept both analog (YPbPr) and digital (YCbCr) signals.*

*2. HTPC = Home Theater PC*

SERIAL NUMBER

RUMA-011170

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